DOCUMENT RESUME

ED 461 438 PS 030 262

AUTHOR Denton, Kristin; West, Jerry
TITLE Children's Reading and Mathematics Achievement in Kindergarten and First Grade.
INSTITUTION National Center for Education Statistics (ED), Washington, DC.
REPORT NO NCES-2002-125
PUB DATE 2002-03-00
NOTE 90p.
AVAILABLE FROM ED Pubs, P.O. Box 1398, Jessup, MD 20794-1398. Tel: 877-433-7827 (Toll Free); Fax: 301-470-1244; e-mail: edpuds@inet.ed.gov; Web site: http://www.ed.gov/pubs/edpubs.html; Web site: http://nces.ed.gov.
PUB TYPE Numerical/Quantitative Data (110) -- Reports - Research (143)
EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS *Academic Achievement; Achievement Gains; *Elementary School Students; *Grade 1; *Kindergarten; Longitudinal Studies; *Mathematics Achievement; National Surveys; Primary Education; *Reading Achievement
IDENTIFIERS *Early Childhood Longitudinal Survey

ABSTRACT

This report is the third in a series based on findings about young children's early experiences with school from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K). Sponsored by the U.S. Department of Education, National Center for Education Statistics, the ECLS-K study selected a nationally representative sample of kindergartners in the fall of 1998 and is following these children through the spring of their fifth-grade year. The study collects information directly from the children, their families, teachers, and schools. This report looks at children's school performance during first grade in terms of their reading and mathematical knowledge and skills by relating them to child, family, and school characteristics. The report finds that some of the differences in children's reading and mathematics knowledge and skills by child, family, and school characteristics that are present as they enter kindergarten persist into the spring of their kindergarten and spring of their first-grade year. For example, poor children consistently score below the national average in both reading and mathematics across the kindergarten year and into the spring of first grade. These findings also suggest differences that are beginning to emerge by children's sex. By spring of first grade, females are more likely to be reading (understanding words in context), whereas, males are more likely be proficient at advanced mathematics (multiplication and division). However, some differences do seem to wane. For example, in both reading and mathematics, Hispanic children's scores tend to move upward toward the national mean over these two school years. The longitudinal nature of the ECLS-K will enable researchers to track these differences in terms of children's third- and fifth-grade reading and mathematics performance. The report also notes that children who bring certain knowledge and skills with them to kindergarten are likely to be at an advantage in classroom learning compared to peers who do not possess such resources. The descriptive analyses of the report show that children who have specific cognitive knowledge and

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skills, are read to frequently, possess positive approaches to learning, and enjoy very good or excellent general health, perform better in reading and mathematics than those without these resources. (Includes data and standard error tables. Appended is a table of regression coefficients for the relationship between children's resources and skills to their spring kindergarten and spring first-grade reading performance. Contains 18 references.) (HTH)

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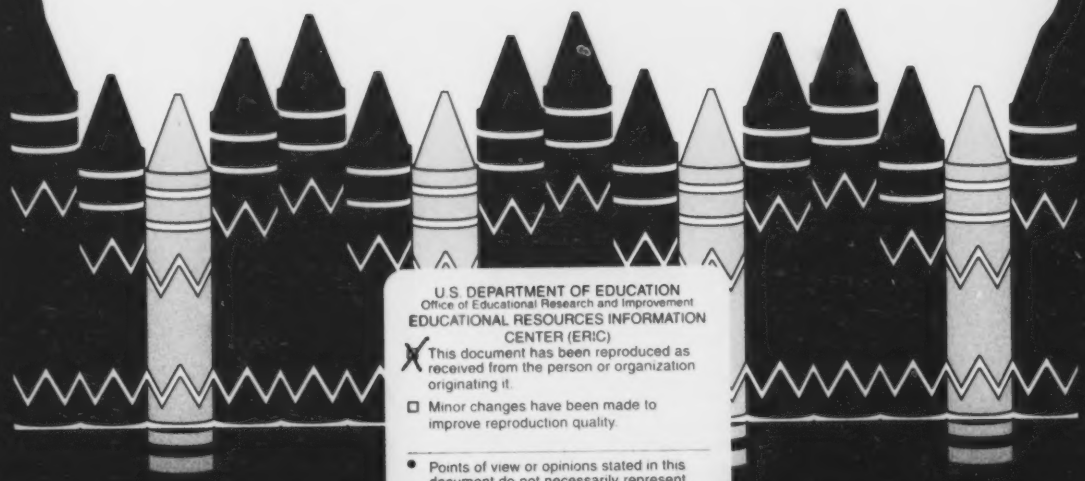

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Children's Reading and Mathematics Achievement in Kindergarten and First Grade

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Suggested Citation

U.S. Department of Education, National Center for Education Statistics. *Children's Reading and Mathematics Achievement in Kindergarten and First Grade,* NCES 2002–125, by Kristin Denton and Jerry West. Washington, DC: 2002.

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Acknowledgments

The authors wish to recognize the 20,000 children and their parents, and the more than 8,000 kindergarten and first grade teachers who participated during the first 2 years of the study. We would like to thank the administrators of the more than 1,000 schools we visited across the United States for allowing us to work with their children, teachers and parents, and for providing us with information about their schools. We are especially appreciative of the assistance we received from the Chief State School Officers, district superintendents and staff, and private school officials.

We would like to thank Elvie Germino Hausken and Jonaki Bose of the National Center for Education Statistics, and Lizabeth Reaney, Naomi Richman, Amy Rathbun, Jill Walston, Thea Kruger, Sarah Kaffenberger, Nikkita Taylor, and DeeAnn Brimhall of the Education Statistics Services Institute for their hard work and dedication in supporting all aspects of the ECLS-K program. We also appreciate the comments we received from program offices within the Department of Education and NCES staff members Sam Peng, Laura Lippman, and Bill Fowler. In addition, we would like to recognize the input we received from Barbara Wasik of Johns Hopkins University, Doug Downey of the Ohio State University, and Susan Fowler of the University of Illinois at Urbana-Champaign.

Westat, Incorporated—in affiliation with the Institute for Social Research and the School of Education at the University of Michigan, and the Educational Testing Service, under the direction of the National Center for Education Statistics (NCES)—conducted the base-year and first grade study. We would like to express our appreciation for the efforts of the staff from each of these organizations, and especially to the more than 400 field staff who conducted the child assessments and parent interviews in fall 1998, spring 1999, and spring 2000.

We wish to acknowledge the support that we have received from the Head Start Bureau of the Administration on Children, Youth and Families; the Economic Research Service of the U.S. Department of Agriculture; the National Institute for Child Health and Human Development; and the U.S. Department of Education's Office of Special Education Programs, Office of Bilingual Education and Minority Languages Affairs, and Planning and Evaluation Service.

A special thank you to Kendra Chandler Webb, age 9 (1994), for designing the ECLS logo, and to Westat for aiding in the design of the cover.

Executive Summary

Children's experiences with school are almost as varied as children themselves. This report is the third in a series based on findings about young children's early experiences with school from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K). Sponsored by the U.S. Department of Education, National Center for Education Statistics (NCES), the ECLS-K selected a nationally representative sample of kindergartners in the fall of 1998 and is following these children through the spring of fifth grade. The study collects information directly from the children, their families, teachers, and schools. The full ECLS-K base-year sample is comprised of approximately 22,000 children who attended about 1,000 kindergarten programs during the 1998–99 school year.

The first two reports, *America's Kindergartners* (West, Denton, and Germino Hausken 2000) and *The Kindergarten Year* (West, Denton, and Reaney 2001), provided a national picture of the knowledge and skills of children at kindergarten entry and across the kindergarten year. Both reports revealed that while first-time kindergartners are similar in many ways, their knowledge and skills differ in relation to their age at school entry, race/ethnicity, health status, home educational experiences, and child care histories.

This report presents a picture of these children as first-graders.[1] The first two reports laid the foundation for a basic understanding of children's achievement across the kindergarten year. This report continues the story by providing information about children's knowledge and skills in the first-grade year. The report looks at children's school performance in terms of their reading and mathematical knowledge and skills. To address the multifaceted nature of children's development, this report relates children's reading and mathematical knowledge and skills to child, family, and school characteristics. Whereas prior reports (i.e., *The Kindergarten Year)* specifically addressed the gains children made in reading and mathematics across the school year, this report will focus more on the status of children's reading and mathematics achievement in the spring of kindergarten and the spring of first grade. Taking a broad view of child development, the report explores how children's literacy, approaches to learning, and general health status at kindergarten entry relate to their spring kindergarten and first grade reading and mathematics knowledge and skills.

[1] First-graders refers to first-time kindergartners who were promoted to first grade in the fall of 1999. For further detail, see the *Analytic Sample* section of this report.

When conceptualizing literacy in young children, since young children's reading and mathematical ability are highly related, it is important to consider not only their reading skills but also their reading environment and their mathematical reasoning skills (West, Denton, and Germino Hausken 2000; National Research Council 1989; National Institutes of Health 2000). Recognizing numbers (i.e., math skills) and recognizing letters (i.e., reading skills) both represent a child's ability to understand that symbols have meaning. Therefore, this report provides information on multiple aspects of children's early literacy, such as their ability to recognize letters, the frequency with which they are read to, and their ability to recognize numbers, shapes, and understand the relative size of objects.

Findings[2]

This section presents highlights of the findings. The report uses data from the ECLS-K to address the following questions:

- What reading and mathematics knowledge and skills do children demonstrate in the spring of first grade? Do children's knowledge and skills differ by certain child, family, and school characteristics?
- What is the relationship of children's early literacy, approaches to learning, and general health status as they enter kindergarten to their spring kindergarten and first grade reading and mathematics achievement? In particular, how do the following resources relate to children's spring kindergarten and spring first-grade achievement:
  - proficiency in recognizing letters,
  - being read to at least three times a week,
  - proficiency in recognizing numbers and basic shapes,
  - proficiency in the mathematical concept of relative size,
  - demonstrating a positive approach to learning often or very often, and
  - being in very good to excellent general health?

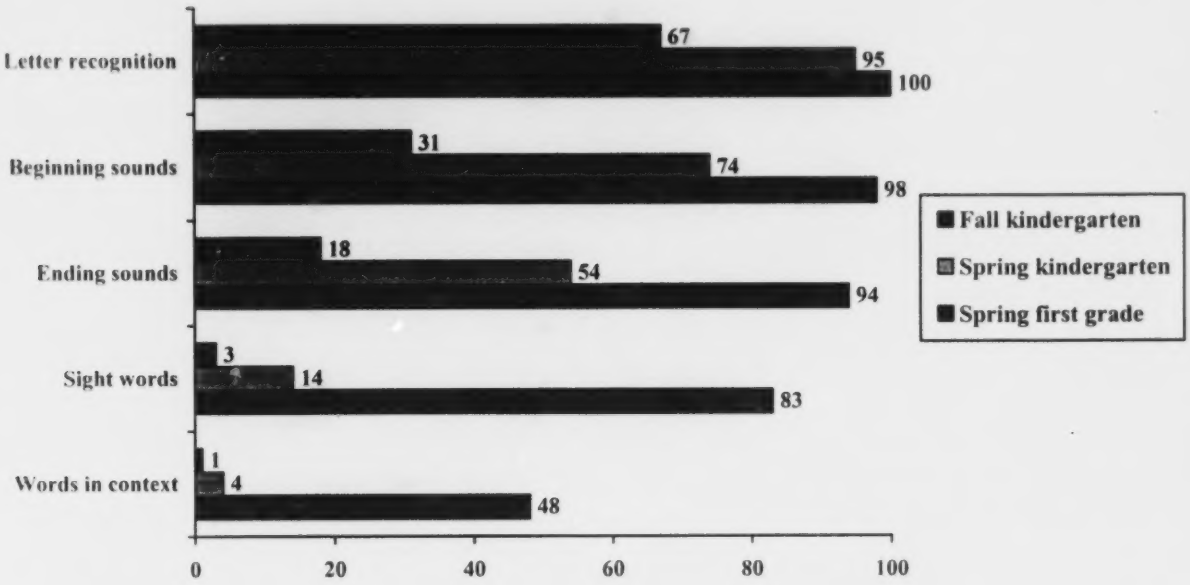
[2] In an effort to provide information on the early education experiences of the typical child (i.e., one who spent 1 year in kindergarten and then continued on to first grade), the children included in the analysis entered kindergarten for the first time in fall of 1998 and were promoted on time to first grade in the fall of 1999. Further, since this report provides information on children's early reading achievement, and the reading assessment was administered in English, the analyses in this report are limited to those children who were administered the English reading assessment. For more information, see the *Analytic Sample* section of the report. To achieve consistency in the sample across rounds (i.e., fall kindergarten, spring kindergarten and spring first grade), the analyses in this report are limited to those children who were assessed in English in all three rounds of data collection.

What reading and mathematics knowledge and skills do children demonstrate in the spring of first grade? Do children's knowledge and skills differ by certain child, family, and school characteristics?

What Children Know

When children begin kindergarten, 67 percent recognize their letters. By the spring of kindergarten, most (95 percent) know the letters of the alphabet; and after 2 years of school, essentially all children (100 percent) can recognize the letters of the alphabet. At kindergarten entry, about one-third (31 percent) of children understand the letter-sound relationship at the beginning of words and about one in six children (18 percent) understand the letter-sound relationship at the end of words. By the spring of kindergarten, about three-quarters (74 percent) of children make the letter-sound connection at the beginning of words and just over half (54 percent) of children make this connection at the ending of words. By the spring of first grade, almost all children have mastered these reading skills (98 and 94 percent, respectively) (figure A). By the spring of first grade, about five in six children (83 percent) recognize common words by sight (sight words), and about one-half (48 percent) of children understand words in context (compared to 14 and 4 percent, respectively, in the spring of kindergarten) (figure A, table 1).

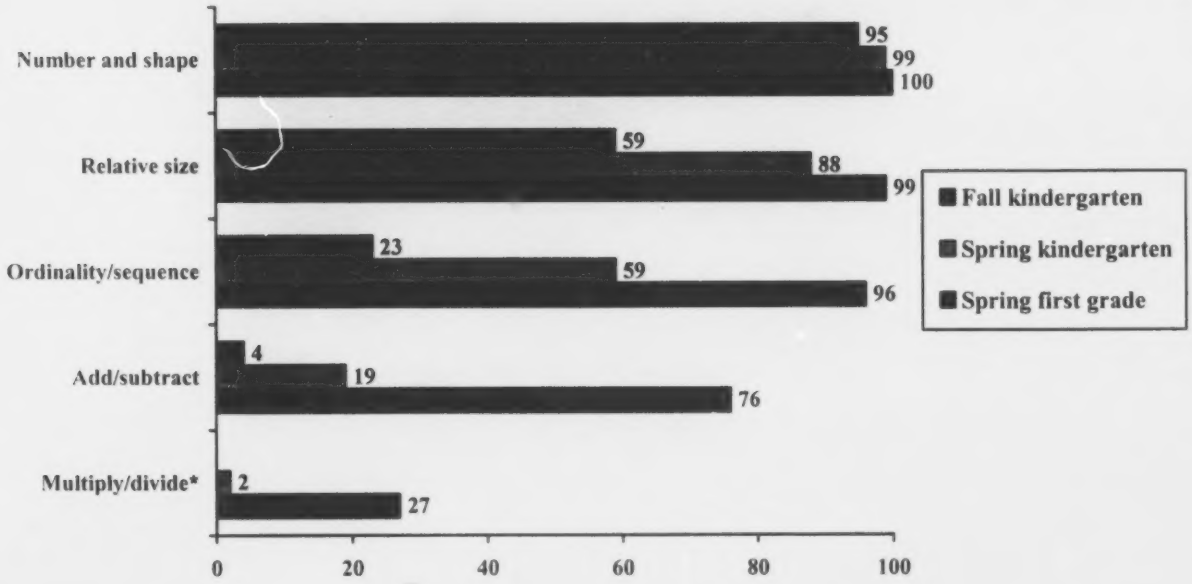
Figure A.—Percentage of children demonstrating specific reading knowledge and skills for fall kindergarten, spring kindergarten, and spring first grade: 1998–99 and 2000



NOTE: Estimates reflect children assessed in English in all three rounds of data collection and who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999. The estimates in this report do not exactly match those found in previous reports based on the same data. This report uses a different weight in making the estimates, which is stricter in its response requirements and utilizes a slightly smaller sample of children. For more information, see the *Analytic Sample* section of this report.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Base Year Public-Use and First Grade Restricted-Use data files.

By the spring of kindergarten, a large percentage (88 percent) of children understand the concept of relative size (e.g., can count beyond 10 and understand and can use nonstandard units of length to compare objects). By the spring of first grade, most children (96 percent) have mastered ordinality and sequence (the understanding of the relative position of objects); and about three-quarters (76 percent) demonstrate proficiency in adding and subtracting basic whole units. Moreover, by the spring of first grade, about one-quarter (27 percent) demonstrate proficiency in multiplying and dividing simple whole units (figure B, table 2).

Figure B.—Percentage of children demonstrating specific mathematics knowledge and skills for fall kindergarten, spring kindergarten, and spring first grade: 1998–99 and 2000



*The fall kindergarten estimate for the percentage of children demonstrating proficiency in multiplication and division is less than .5 percent.
NOTE: Estimates reflect children assessed in English in all three rounds of data collection and who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999. The estimates in this report do not exactly match those found in previous reports based on the same data. This report uses a different weight in making the estimates, which is stricter in its response requirements and utilizes a slightly smaller sample of children. For more information, see the *Analytic Sample* section of this report.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Base Year Public-Use and First Grade Restricted-Use data files.

What Children Know, by Child, Family, and School Characteristics

Differences in children's achievement (as represented by their overall achievement score) by their family's poverty status, race/ethnicity, and school type persist from kindergarten through the spring of first grade. However, children's overall reading and mathematics achievement does not vary by their sex (tables 3 and 4).

Differences (or lack of differences) in overall achievement scores only tell part of the story. Another way to think about how certain child and family characteristics relate to their spring achievement is in terms of children's acquisition of *specific* reading and mathematics knowledge and skills. Whether or not certain groups of children acquire certain skills or sets of skills may add meaning to an overall achievement score difference.

In terms of specific first-grade reading and mathematics skills and knowledge, females are more likely to recognize words by sight and understand words in context than males. Males and females are equally likely to be adding and subtracting; but, in the spring of first grade, males are more likely than females to solve problems that require multiplication and division. Simply stated, by the spring of first grade, females are more likely to be reading and males are more likely to be successful at advanced mathematical operations (i.e., multiplication and division) (tables 1 and 2).

When considering the poverty status of children's families from the kindergarten year, first-graders from nonpoor families are more likely to recognize words by sight than first-graders from poor families. The same is true for addition and subtraction. Moreover, about twice as many first-graders from nonpoor families are proficient at understanding words in context and performing multiplication and division as first-graders from poor families (tables 1 and 2).

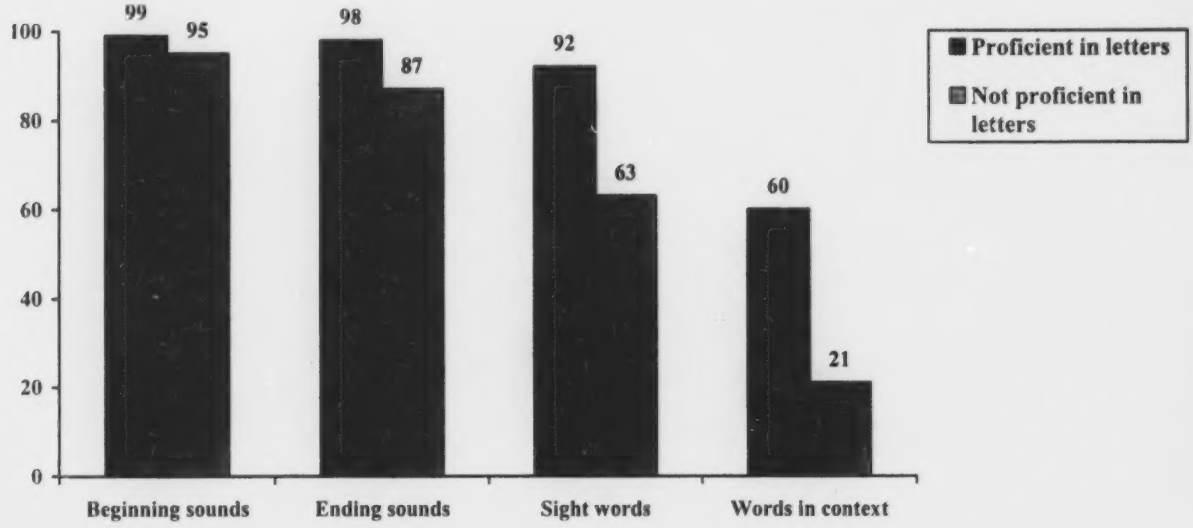
There are also differences by children's race/ethnicity. White children are more likely than Black or Hispanic children to recognize words by sight, understand words in context, solve addition and subtraction problems, and solve multiplication and division problems by the spring of first grade. Asian children are more likely than Black or Hispanic children to recognize words by sight, understand words in context, and solve multiplication and division problems. In the spring of first grade, Hispanic children are more likely than Black children to demonstrate proficiency in these particular reading and mathematics areas (tables 1 and 2).

What is the relationship of children's early literacy, approaches to learning, and general health status as they enter kindergarten to their spring kindergarten and first grade reading and mathematics achievement?

Children who recognize their letters, who are read to at least three times a week, who recognize their basic numbers and shapes, and who demonstrate an understanding of the mathematical concept of relative size as they enter kindergarten demonstrate significantly higher overall reading and mathematics knowledge and skills (in terms of an overall scale score) in the spring of kindergarten and the spring of first grade than children who do not have these resources. The same pattern is true for children who frequently demonstrate a positive approach to learning and who are in very good to excellent health as they enter kindergarten (tables 6 and 7).

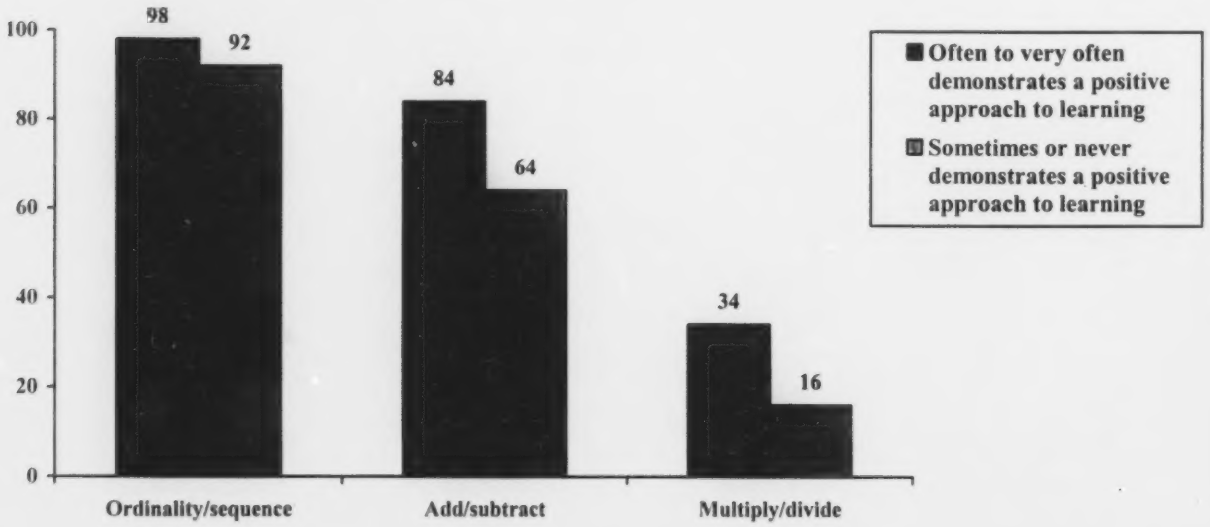
An analysis of the specific skills children acquire shows that children who recognize their letters, who are read to at least three times a week, who recognize their basic numbers and shapes, and who demonstrate an understanding of the mathematical concept of relative size as they enter kindergarten are more likely to understand the letter-sound relationship at the beginning and ending of words, read words by sight, and understand words in context by the spring of first grade (figure C, table 8). In mathematics, children who recognize their letters, who are read to at least three times a week, who recognize their basic numbers, and shapes, and who demonstrate an understanding of the mathematical concept of relative size as they enter kindergarten are more likely to understand the mathematical concept of ordinality and sequence, successfully solve addition and subtraction problems, and successfully solve multiplication and division problems. The same pattern is true for children who frequently demonstrate a positive approach to learning and for those who are in very good to excellent health as they enter kindergarten (tables 8 and 9, figure D).

Figure C.—Percentage of children demonstrating specific reading knowledge and skills in the spring of first grade by whether they were proficient in recognizing their letters at kindergarten entry: 2000



NOTE: Estimates reflect children assessed in English in all three rounds of data collection and who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999. The estimates in this report do not exactly match those found in previous reports based on the same data. This report uses a different weight in making the estimates, which is stricter in its response requirements and utilizes a slightly smaller sample of children. For more information, see the *Analytic Sample* section of this report.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Base Year Public-Use and First Grade Restricted-Use data files.

Figure D.—Percentage of children demonstrating specific mathematics knowledge and skills in the spring of first grade by their approach to learning at kindergarten entry: 2000



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SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Base Year Public-Use and First Grade Restricted-Use data files.

Summary

Children begin kindergarten with different sets of knowledge and skills. Children's reading and mathematics knowledge and skills that differ by child, family, and school characteristics at the beginning of kindergarten persist into the spring of kindergarten and the spring of first grade. The findings in this report also suggest the beginnings of differences in children's reading and mathematics performance by their sex. By the spring of first grade, females are more likely to be reading, whereas males are more likely to be proficient at advanced mathematics (i.e., multiplication and division). The longitudinal nature of the ECLS-K will enable researchers to track these differences in terms of children's third and fifth grade reading and mathematics performance.

Children who begin kindergarten with certain resources seem to be at an advantage. Children who demonstrate early literacy skills and who come from a positive literacy environment, who possess a positive approach to learning, and who enjoy very good or excellent general health seem to perform better

after 1 and even 2 years of formal schooling than children who do not have these resources. Specifically, these children perform better in spring kindergarten and spring first-grade reading and mathematics.

This third report from the ECLS-K, in conjunction with *America's Kindergartners* and *The Kindergarten Year*, provides descriptive information on young children's achievement across kindergarten and first grade. The ECLS-K will continue to follow these children into third and fifth grades. The study will provide researchers not only with an understanding of how children's early literacy, approaches to learning, and general health status at kindergarten entry shape their later achievement but also of how these resources need to be maintained and further developed for continued scholastic success. The valuable information collected through this study will help us better understand the early education and elementary school experience of our nation's children.

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Children's Reading and Mathematics Achievement in Kindergarten and First Grade

Children's experiences with school are almost as varied as the children themselves. Children's early education sets the tone for their later learning. Therefore, it is important to capture information on children's initial interactions with school; that is, their kindergarten and first grade years.

This report is the third in a series based on findings about young children's early experiences with school from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K). The ECLS-K is a multisource, multimethod study that focuses on children's early education beginning with kindergarten. The design of the ECLS-K has been guided by a framework of children's development and schooling that emphasizes the interaction between the child and family, the child and school, the family and school, and the family, school, and community. The ECLS-K includes measures of children's health status, socio-emotional, and student achievement and their family, school/classroom, and community environments.

Sponsored by the U.S. Department of Education, National Center for Education Statistics (NCES), the ECLS-K selected a nationally representative sample of kindergartners in the fall of 1998 and is following these children through the spring of fifth grade. The study collects information directly from the children, their families, teachers, and schools. The full ECLS-K base-year sample is comprised of approximately 22,000 children who attended about 1,000 kindergarten programs during the 1998–99 school year.

The first report, *America's Kindergartners* (West, Denton and Germino Hausken 2000), provided a national picture of the knowledge and skills of beginning kindergartners. It revealed that while first-time kindergartners are similar in many ways, differences exist in their knowledge and skills in relation to their age at school entry, race/ethnicity, health status, home educational experiences, and child care histories. The differences found at school entry were consistent with the differences in other national studies of older children (e.g., National Assessment of Educational Progress, National Education Longitudinal Study of 1998).

The Kindergarten Year (West, Denton, and Reaney 2001), the second report, showed that children considered at-risk for school failure acquired many of the basic skills in reading and mathematics during their first year of school that they did not have when they began the kindergarten year. Consequently, by the spring of kindergarten, the majority of these children knew their letters, numbers, and shapes; about

half made the connection between letter and sound at the beginning of words; and almost three-quarters understood the mathematical concept of relative size (e.g., out of two objects, identify which object is longer). However, these same children fell behind their more advantaged classmates. Specifically, across the kindergarten year, the gap between disadvantaged children and other children widened in more advanced reading (e.g., recognizing words by sight) and mathematics skills (e.g., adding and subtracting).

This report, the third in the series, opens with a picture of these same children as first-graders. The first two reports laid the foundation for a basic understanding of children's achievement across the kindergarten year. Prior reports (i.e., *The Kindergarten Year)* specifically addressed the gains children made in reading and mathematics across the school year. This report focuses more on the status of children's reading and mathematics achievement in the spring of kindergarten and the spring of first grade.

To address the multifaceted nature of children's development, this report relates children's reading and mathematical knowledge and skills to child, family, and school characteristics. This report takes a broad view of child development and describes some of the basic relationships between children's literacy, their approaches to learning, and their general health status at kindergarten entry to their later kindergarten and first-grade reading and mathematics knowledge and skills.

Literacy

Literacy is an important construct that relates to kindergartners' and first-graders' early experiences with school. Literacy not only refers to children's familiarity with language and the printed word but also to their awareness of numbers, logic, and mathematical operations (National Research Council 1989). For example, one of the earliest steps to reading is the ability to understand that print has meaning (National Reading Panel 2000). This often refers to children's knowledge and awareness of the alphabet as represented in print. Most preschoolers are beginning to recognize some printed letters and words (Committee on the Prevention of Reading Difficulties in Young Children 1998). Frequently, children are most familiar with the letters in their own names. Children who can recognize some of the letters of the alphabet as they enter kindergarten are at an advantage (Committee on the Prevention of Reading Difficulties in Young Children 1998). We know from *America's Kindergartners* (West et al. 2000) that about two-thirds of children can recognize their letters as they enter kindergarten. The question is, does the ability to recognize letters at kindergarten entry relate to spring kindergarten and first grade achievement?

Reading to children is shown to have a positive effect on children's literacy outcomes (Denton, Reaney, and West 2001; Snow, Burns and Griffin 1998). Through experience with books, children gain important exposure to written language. They begin making connections between the spoken word and the printed word (Beck and Juel 1999). Policymakers contend that it is important to read to your child (Lyon 1999). *America's Kindergartners* (West et al. 2000) provided important information about the frequency with which the average parent reads to his/her young child. About 45 percent of parents report reading to their children every day, whereas 80 percent of parents report reading to their children at least three times a week. Do children who are read to at least three times a week perform better in kindergarten and first grade than children who are read to less than three times a week?

In addition to their emergent reading skills (i.e., recognizing letters) and exposure to literacy activities (i.e., being read to), children who understand their numbers and shapes are on the road to math literacy. It is important to note that math is not simply about numbers and numerical mathematical operations. Mathematics knowledge and skills also include the ability to draw inferences, see relationships and reason logically (National Research Council 1989). Consequently, young children who possess an understanding of numbers, shapes and a basic ability to conceptualize objects as they enter kindergarten may be at an advantage in terms of both their reading and mathematics learning. *America's Kindergartners* (West et al. 2000) revealed that the majority of children recognized basic numbers and shapes as they entered kindergarten and about three in five understood the concept of relative size (e.g., comparing nonstandard units of measure). Consequently, does the ability to recognize basic numbers and shapes and the mastery of the concept relative size relate to children's spring reading and mathematics achievement in kindergarten and first grade?

Approaches to Learning

The development of young children is multidimensional; it needs to be conceptualized in terms of cognitive aspects such as reading and mathematics, and how they approach learning. Accordingly, when looking at the process by which children develop as learners, it is important to understand how they approach learning. Skills such as paying attention and persisting at tasks are important skills in the learning process (Schunk and Zimmerman 1996). These skills are integral to how children approach learning, in part, by representing how children regulate their learning experiences. Children who are self-regulated learners may have an advantage (Schunk and Zimmerman 1996, Paris and Cunningham 1996). Consequently, children who often or very often demonstrate positive approaches to learning may more

rapidly acquire cognitive knowledge and skills. Thus, are there differences in children's spring kindergarten and first grade cognitive achievement by whether they often or very often demonstrate a positive approach to learning as they enter kindergarten?

General Health

Children's health status is one of the basic foundations in successful learning. Children who have difficulties with their health in general may be less able to participate in the classroom, may be prone to more frequent absences, and therefore may be at-risk learners; whereas, children with sound general health may be at an advantage (Shonkoff 1992). *America's Kindergartners* (West et al. 2000) reported that 51 percent of children are considered by their parents to be in excellent general health as they enter kindergarten and 32 percent are reported in very good general health as they enter kindergarten. What, then, is the relationship between children's health at kindergarten entry and their spring kindergarten and first grade cognitive achievement?

Questions

This report uses data from the ECLS-K to address the following:

- What reading and mathematics knowledge and skills do children demonstrate in the spring of first grade? Do children's knowledge and skills differ by certain child, family, and school characteristics?
- What is the relationship between children's early literacy, approach to learning, and general health status as they enter kindergarten and their spring kindergarten and first grade reading and mathematics achievement? In particular, how do the following relate to children's spring kindergarten and spring first grade achievement:
  - proficiency in recognizing letters,
  - being read to at least three times a week,
  - proficiency in recognizing numbers and basic shapes,
  - proficiency in the mathematical concept of relative size,
  - demonstrating a positive approach to learning often or very often, and
  - reported to be in very good to excellent general health?

Organization of the Report

The findings in this report are organized in two sections, which coincide with the two sets of questions identified above. First, information on children's reading and mathematics skills and knowledge at the spring of first grade by child, family, and school characteristics are presented. Next, the report presents information on the relationship of resources children possess at kindergarten entry to their spring kindergarten and first grade reading and mathematics achievement. Within each section, children's reading and mathematics knowledge and skills are presented in terms of an indicator of overall achievement (i.e., a t-score; for information on t-scores, see the *Measures* section of this report) and in terms of specific skills (i.e., proficiencies).

When information on children's reading and mathematics knowledge and skills is presented, estimates are based on children in the sample who entered kindergarten for the first time in the fall of 1998 and who received the ECLS-K direct cognitive assessment in English in both the fall and the spring of kindergarten, and the spring of first grade. Comparisons made in the text are tested for statistical significance to ensure that the differences are larger than might be expected, due to sampling variation. All differences described are significant at the .05 level.[3]

[3] Not all significant differences are discussed in this report. Due to the large sample size, nearly all differences (no matter how substantively minor) are significant. Therefore, only differences of about one-quarter of a standard deviation are discussed (e.g., 2 or 3 points for a mean t-score difference) (for review, see Cohen 1988).

Measures

This report includes information collected through direct one-on-one child assessments, parent interviews, and teacher questionnaires. These are described in general terms below. For more technical information (e.g., psychometric properties, or more detailed operational information), see the *Methodology and Technical Notes* section of this report or the *ECLS-K Base-Year User's Manual* (National Center for Education Statistics 2001).

Children's Reading and Mathematics Knowledge and Skills

The ECLS-K reading and mathematics assessment was directly administered to children in a quiet one-on-one setting. Children used pointing or verbal responses to complete the tasks; they were not asked to write anything or to explain their reasoning. The data were collected using computer-assisted interviewing methodology. The assessment included the use of a small easel with pictures, letters of the alphabet, words, short sentences, numbers, or number problems. This report includes information from the assessments administered in the fall and spring of kindergarten, and the spring of first grade.[4]

In the ECLS-K, the reading assessment,[5] specifically designed for the ECLS-K (National Center for Education Statistics 2001), was administered in English, and the mathematics assessment was administered in both English and Spanish. Prior to administering the English reading and mathematics assessment, children's English language proficiency was evaluated. Children whose home language was other than English (as determined by school records) were administered the Oral Language Development Scale (OLDS) (for more information, see the *ECLS-K Base-Year User's Manual,* National Center for Education Statistics 2001). If children demonstrated sufficient proficiency in English for the ECLS-K direct child assessment, they received the English reading and mathematics battery. This report focuses on those children who were assessed in English, at all points in time.

The reading assessment included questions designed to measure basic skills (letter recognition, beginning and ending sounds), vocabulary (receptive vocabulary, as in "point to the picture of the cat"), and comprehension (listening comprehension, words in context). Comprehension items were targeted to

[4] A subsample of children was also assessed in the fall of first grade. Findings from that assessment will be included in future reports.

[5] In deference to time and efficiency, the cognitive assessment was developed as a two-stage assessment. Separately for each domain, all children received the first-stage routing section. A routing section is a set of items of varying difficulty levels, in which all children receive all items. Depending on the number of items children correctly answered in the routing section, they were then "routed" into a second-stage form, which varied by level of difficulty. The two-stage design allowed for the maximum amount of information with efficiency of time. The routing section provided a rough estimate of each child's achievement level, so that a second-stage form with items of the appropriate difficulty for maximizing measurement accuracy could be selected. Scores for each domain were developed using Item Response Theory (IRT). These scores can be compared regardless of which second-stage form a student was administered. In other words, each child has a score that reflects the entire battery of items.

measure skills in initial understanding, developing interpretation, personal reflection, and demonstrating critical stance (evaluative judgments about the text, such as recognizing implausible events).

The mathematics assessment items were designed to measure skills in conceptual knowledge, procedural knowledge, and problemsolving. Approximately one-half of the mathematics assessment consisted of questions on number sense and number properties and operations. The remainder of the assessment included questions in measurement; geometry and spatial sense; data analysis, statistics, and probability; and patterns, algebra, and functions. Each of the mathematics assessment forms contained several items for which manipulatives (e.g., blocks) were available for children to use in solving the problems. Paper and pencil were also offered to the children to use for the appropriate parts of the assessment.

In this report, information on children's overall reading and mathematics knowledge and skills are presented as a standardized t-score.[6] T-scores provide norm-referenced measurements of achievement—that is, estimates of achievement level *relative to the population as a whole*. A high t-score mean for a particular subgroup indicates that the group's performance is high in comparison to other groups. It does not mean that group members have mastered a particular set of skills, only that their performance level is greater than a comparison group. Similarly, a change in t-score means over time reflects a change in the group's status with respect to other groups. Consequently, t-scores are not ideal for indicating gains in achievement.

In addition to the standardized overall achievement score (i.e., t-score) for reading and mathematics, specific proficiency scores were calculated.[7] These proficiency scores represent a progression of skills. The reading assessment contained five proficiency levels (from easiest to most difficult): (1) recognizing letters (identifying upper and lower case letters by sight); (2) understanding the letter-sound relationship at the beginning of words (identifying the letter that represents the sound at the beginning of a word); (3) understanding the letter-sound relationship at the end of words (identifying the letter that represents the sound at the end of a word); (4) recognizing words by sight (reading simple words aloud); and (5) understanding words in context (listening comprehension and reading simple text passages).

The mathematics assessment also contained five proficiency levels: (1) numbers and shapes refers to a cluster of items that measures reading numerals, recognizing shapes, and counting to 10; (2) relative size refers to a cluster of items that measure reading numerals, counting beyond 10, sequencing patterns, and using nonstandard units of length to compare objects; (3) ordinality refers to items that measure number sequence, reading two-digit numerals, identifying the ordinal position of an object, and solving a word problem; (4) addition and subtraction refers to a cluster of items which measure calculating sums up to 10

[6] The t-score is a transformation of the Item Response Theory-based (IRT) scale score.
[7] For information on reliability of the scores, see the *Methodology and Technical Notes* section.

and relationships of numbers in sequence; and (5) multiplication and division involves items that measure problemsolving using multiplication and division and number patterns.

Children's proficiency in specific reading and mathematics skills was calculated in two different ways. First, to estimate the percentage of the total population who can demonstrate specific skills, proficiency probability scores were utilized (i.e., a score that is the probability a child would have passed the proficiency level). These scores refer to IRT-based probabilities, and are *continuous* (e.g., ranging from 0 to 1). They are estimates based on overall performance rather than counts of actual item responses. Second, to determine a *dichotomous* (e.g., yes or no) cut-point of whether a specific child is proficient in a specific skill, the specific items in a cluster (i.e., proficiency area) were utilized. For each proficiency level, a score of 1 was assigned to children who correctly answered at least three of the four items in the cluster, and a score of 0 was given if at least two items were incorrect or "don't know." Both the continuous score and the dichotomous score reference the exact same set of assessment items. Due to the slight computational difference, the estimates produced by these scores do not exactly match (see tables 1 and 2 versus table 5). The continuous proficiency probability scores maximize the amount of information the ECLS-K captured on children's reading and mathematics knowledge and skills (through an IRT model, information is provided on every item in the assessment battery). Therefore, this report utilizes the proficiency probability scores when presenting information on children's reading knowledge and skills. The dichotomous proficiency scores, in this report, are only used to determine, in a yes/no fashion, whether a child demonstrated a specific reading and mathematics skill at kindergarten entry (e.g., table 5).

Children's Approaches to Learning

Teachers provided information on how the children approach learning. Teachers were asked to respond to a series of questions, asking about the frequency with which the specific sampled children in their classrooms demonstrated certain behaviors. The *approaches to learning* scale measures behaviors that affect the ease with which children can benefit from the learning environment. It includes six items that rate the child's attentiveness, task persistence, eagerness to learn, learning independence, flexibility, and organization. In this report, information about the frequency of such behaviors is presented in terms of *often/very often* versus *sometimes/never*.

General Health, Home Educational Activities and Child/Family Characteristics

Parents provided information during a computer-assisted telephone interview. The parent interview was conducted primarily in English, but provisions were made to interview parents who spoke other languages. Parents were asked to provide information on how often in a week a family member reads to their child (ranging from never to every day). Parents were also asked to provide information on their

children's health. Specifically, parents were asked to rate their child's general health from poor to excellent.[8] The following information presented in this report also comes from the parent interview: poverty status of the household, confirmation of the children's race/ethnicity, how frequently children are read to and children's general health. More information on how each of these was asked in the parent interview can be found in the *Methodology and Technical Notes* section.

Analytic Sample

In an effort to provide information on the early education experiences of the typical child (i.e., one who spent 1 year in kindergarten and who continued on to first grade), the children included in the analysis entered kindergarten for the first time in fall of 1998 and were promoted to first grade in the fall of 1999.[9] In terms of the population distributions for children who repeated kindergarten in the fall of 1999 versus those who were promoted to first grade in the fall of 1999: repeaters were 67 percent White,[10] 16 percent Black, 10 percent Hispanic, 1 percent Asian, 5 percent Other, and 27 percent poor; those promoted to first grade in the fall of 1999 were 62 percent White, 17 percent Black, 13 percent Hispanic, 2 percent Asian, 5 percent Other, and 18 percent poor.

Further, since this report provides information on children's early reading achievement, and the reading assessment was administered in English, the analyses in this report are limited to those children who were administered the English reading assessment. To achieve consistency in the sample across rounds (i.e., fall kindergarten, spring kindergarten and spring first grade), the analyses in this report are limited to those children who were assessed in English in all three rounds of data collection. In terms of English assessment status by race/ethnicity, approximately 68 percent of Hispanic children and 78 percent of Asian children were assessed in English in fall and spring of kindergarten and in the spring of first grade.[11]

The analytic sample included in this report, when weighted, produces population distributions as follows: 50 percent male, 50 percent female; 62 percent White, 17 percent Black, 13 percent Hispanic, 3 percent Asian, and 5 percent Other; 19 percent poor, 81 percent nonpoor; 5 percent public, 15 percent private.

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[8] This measure of general health has been used extensively in national surveys (e.g., the National Health Interview Survey). Research suggests that children who are rated in fair to poor health are more likely to have restricted activity due to health problems as compared with children in very good to excellent health (Ries and Brown 1991). This indicator of child health is one of the key indicators reported by the Federal Interagency Forum on Child and Family Statistics (2001).

[9] Future reports based on the ECLS-K will explore the scholastic experiences of retained children.

[10] In this report, White refers to White, non-Hispanic and Black refers to Black, non-Hispanic.

[11] Future reports will present information on language minority children's achievement and development across kindergarten and first grade.

The estimates in this report do not exactly match those found in *America's Kindergartners* or *The Kindergarten Year*, previous reports based on ECLS-K data (National Center for Education Statistics 2000; National Center for Education Statistics 2001). This report utilizes both fall and spring kindergarten and spring first grade child assessment scores; therefore, a different weight was used in making the estimates. The weight in this report is stricter in its response requirements and utilizes a slightly smaller sample of children. Further, this report focuses on those children who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade "on time" in the fall of 1999. Therefore, the kindergarten year estimates are based on a smaller sample of children (i.e., the approximately 5 percent of first-time kindergarten children who were eventually retained are not included in these estimates).

Findings

What reading and mathematics knowledge and skills do children demonstrate in the spring of first grade? Do children's knowledge and skills differ by certain child, family, and school characteristics?

What Children Know

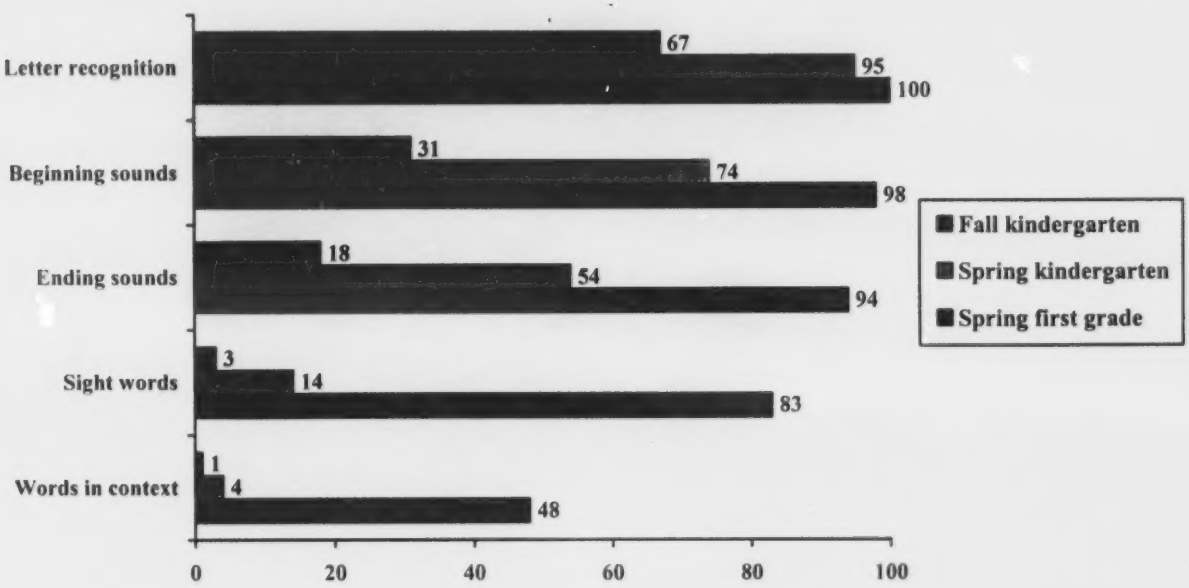
Researchers, policymakers, and practitioners maintain that by the spring of kindergarten children should be able to recognize the letters of the alphabet "quickly and effortlessly," and understand the letter-sound relationship at the beginning and ending of words (National Academy Press 1998; Committee on the Prevention of Reading Difficulties in Young Children 1998). Further, by the spring of first grade, most children should be recognizing words by sight and comprehending words in the context of simple sentences (National Academy Press 1998; Committee on the Prevention of Reading Difficulties in Young Children 1998).

For the most part, this study confirms these expectations. As children enter kindergarten, 67 percent recognize their letters,[12] and indeed by the spring of kindergarten this increases to 95 percent. After 2 years of school, nearly all (100 percent) children can recognize their letters. At kindergarten entry, a little less than a third (31 percent) of children understand the letter-sound relationship at the beginning of words and about one in six (18 percent) children understand the letter-sound relationship at the end of words. By the spring of kindergarten, about three-quarters (74 percent) of children make the letter-sound

[12] The estimates in this report do not exactly match those found in *America's Kindergartners* or *The Kindergarten Year*, previous reports based on ECLS-K data (NCES 2000; NCES 2001). This report utilizes both fall and spring kindergarten and spring first grade child assessment scores; therefore, a different weight was used in making the estimates. The weight in this report is stricter in its response requirements and utilizes a slightly smaller sample of children. Further, this report focuses on those children who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade "on-time" in the fall of 1999. Therefore, the kindergarten year estimates are based on a smaller sample of children (i.e., the approximately 5 percent of first-time kindergarten children who were eventually retained are not included in these estimates).

connection at the beginning of words and about half (54 percent) of children make this connection at the end of words. And, by the spring of first grade, almost all children have mastered these reading skills (98 and 94 percent, respectively) (figure 1). About five in six children (83 percent) recognize common words by sight (sight words); and about one-half (48 percent) of children understand words in context (compared to 14 and 4 percent, respectively, from the spring of kindergarten) (figure 1, table 1).

Figure 1.—Percentage of children demonstrating specific reading knowledge and skills for fall kindergarten, spring kindergarten, and spring first grade: 1998–99 and 2000

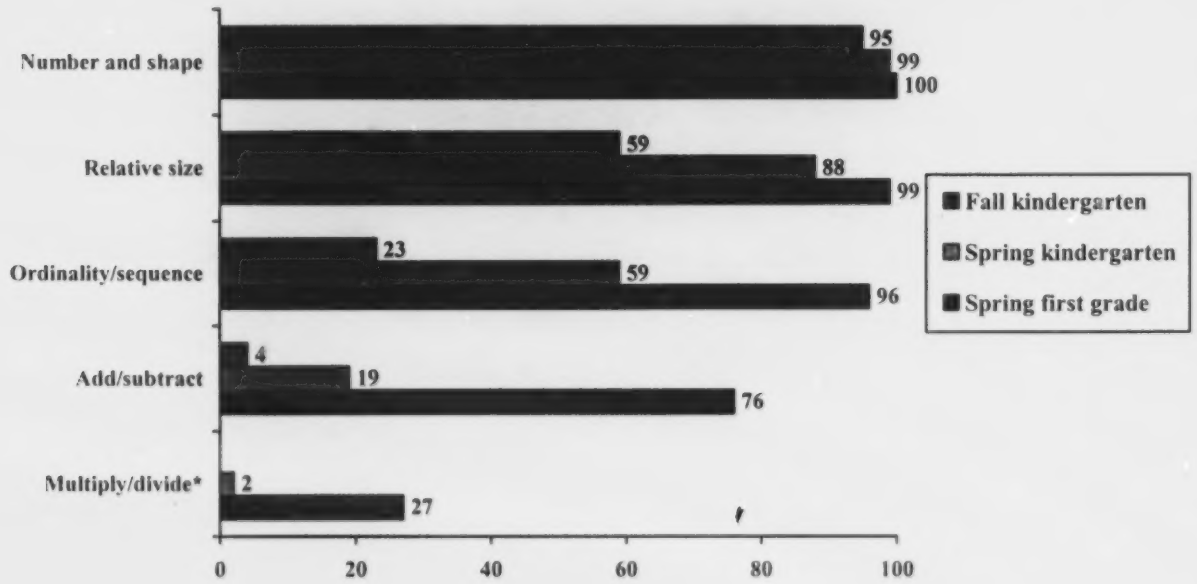


NOTE: Estimates reflect children assessed in English in all three rounds of data collection and who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999. The estimates in this report do not exactly match those found in previous reports based on the same data. This report uses a different weight in making the estimates, which is stricter in its response requirements and utilizes a slightly smaller sample of children. For more information, see the *Analytic Sample* section of this report.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Base Year Public-Use and First Grade Restricted-Use data files.

The National Council of Teachers of Mathematics (NCTM) produces a guide of principles and standards for school mathematics. According to this set of standards, in terms of prekindergarten through second grade mathematics, children should be learning to connect number words and numerals, count with an understanding of how many, understand the relative position of objects (i.e., ordinality), and be able to compute whole numbers with an emphasis on addition and subtraction (NCTM 2000). Analyses of data from the ECLS-K reveal children are acquiring these skills across the early grades. As children enter

kindergarten, the majority (95 percent) already recognize their basic numbers and shapes. By the spring of kindergarten, a large percentage (88 percent) can count beyond 10 and understand the mathematical concept of relative size (i.e., using nonstandard units of length to compare objects). By the spring of first grade, the majority (96 percent) have mastered ordinality (the understanding of the relative position of objects); and about three-quarters (76 percent) demonstrate proficiency in adding and subtracting basic whole units. Moreover, by the spring of first grade about one-quarter (27 percent) demonstrate proficiency in multiplying and dividing simple whole units (figure 2, table 2).

Figure 2.—Percentage of children demonstrating specific mathematics knowledge and skills for fall kindergarten, spring kindergarten and spring first grade: 1998–99 and 2000



*The fall kindergarten estimate for the percentage of children demonstrating proficiency in multiplication and division is less than .5 percent.
NOTE: Estimates reflect children assessed in English in all three rounds of data collection and who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999. The estimates in this report do not exactly match those found in previous reports based on the same data. This report uses a different weight in making the estimates, which is stricter in its response requirements and utilizes a slightly smaller sample of children. For more information, see the *Analytic Sample* section of this report.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Base Year Public-Use and First Grade Restricted-Use data files.

What Children Know, by Child, Family, and School Characteristics

Overall Reading and Mathematics Knowledge and Skills (Scale Scores). One way to analyze differences in children's reading and mathematics knowledge and skills by child, family, and school characteristics is to look at their overall reading and mathematics scale scores. In this report, a standardized representation of the scale score (i.e., t-score) is used. T-scores provide a norm-referenced measure of performance that can be used as an indicator of the extent to which a specific group of children (e.g., males versus females)

ranks higher or lower than the national average and how this relative ranking changes over time. The ECLS-K reading and mathematics t-scores are designed to have a mean of 50 and a standard deviation of 10 (when all scores from the complete sample of children are in the analysis). In this report, however, the spring of kindergarten and the spring of first grade mean t-scores are 51 (tables 3 and 4). This is because the analyses in this report are limited to children in the ECLS-K who entered kindergarten for the first time in the fall of 1998, were promoted on time to first grade, and were assessed in English at all three points in time.

In reading and mathematics, differences in children's achievement by their family's poverty status, their race/ethnicity, and their school type persist from kindergarten through the spring of first grade. However, children's reading and mathematics achievement does not vary by their sex (tables 3 and 4).

In both reading and mathematics, children who are poor (i.e., come from families with incomes below the poverty threshold[13]) consistently score about a half-standard deviation below the national average (i.e., 5 to 7 points). At all three points in time, their achievement is significantly lower than that of nonpoor children (tables 3 and 4).

Racial/ethnic differences also exist in children's kindergarten and first grade reading and mathematics achievement. In both reading and mathematics, White children typically score near the national average (i.e., 51). The one exception is in fall kindergarten math. White children enter kindergarten with a mean score about 3 points above the national average. The picture for Black children is slightly different from that of White children. In reading, Black children enter kindergarten 3 points below the national average, and remain 3 points below the national average through the spring of kindergarten and the spring of first grade. In math, Black children are also significantly below the national average at all three points in time (i.e., 3 to 4 points) (tables 3 and 4).

Hispanic children's reading achievement seems to be moving upward toward the mean.[14] When Hispanic children enter kindergarten they score significantly lower than the national average in reading (4 points), but by the spring of first grade they are on par with the national average (i.e., within 1 point). In terms of

[13] Poverty is a function of household income and household size. For more information, see the *Methodology and Technical Notes* section.
[14] The children included in the estimates in this report are children who were assessed in English at all three points in time. To explore how including children who demonstrated sufficient English language proficiency to receive the English battery in the spring of kindergarten and spring of first grade (i.e., screened into the battery) would impact the estimates, an example analysis using the reading t-scores was run. Comparing the mean t-scores presented in table 2 for children assessed in English at all three points to the mean t-scores for all children who were screened into the English assessment over time, did not yield significant differences. Specifically, the estimates are as follows: mean t-score fall kindergarten, spring kindergarten, spring first grade for children assessed in English at all points in time—51, 51, 51, respectively; mean t-score fall kindergarten, spring kindergarten, spring first grade for children who screened in over time—51, 51, 51, respectively. Further, the same nonsignificant finding is true in terms of specific racial/ethnic groups (e.g., the estimates are as follows: mean t-score fall kindergarten, spring kindergarten, spring first grade for Hispanic children assessed in English at all points in time—47, 49, 50, respectively; mean t-score fall kindergarten, spring kindergarten, spring first grade for Hispanic children who screened in over time—47, 48, 49, respectively. For more information (e.g., methods and breakdowns of children not assessed in English), refer to the *Methodology and Technical Notes* section.

mathematics, Hispanic children score near the national average (i.e., within 2-3 points) in the spring of kindergarten and the spring of first grade. In reading, Asian children consistently are about a half-standard deviation above the national average (3 to 5 points). In mathematics, Asian children are above the national average during their kindergarten year; but by the spring of first grade, they are within 2 points of the national average (tables 3 and 4).

A slightly different way to think about racial/ethnic differences is to compare the groups to one another, versus comparing the groups to the national average. When the achievement of the different racial/ethnic groups is compared, White and Asian children score significantly higher than Black children in reading and mathematics at all three points in time (tables 3 and 4).

Children's reading and mathematics achievement also differs by school type during their kindergarten year. Children who attended private schools during the kindergarten year enter kindergarten scoring significantly higher in reading and mathematics than the national average, and maintain this difference through the spring of first grade (tables 3 and 4).

Specific Reading and Mathematics Knowledge and Skills. Though differences are evident in all five proficiency levels in reading and mathematics at any given point in time (i.e., fall kindergarten, spring kindergarten, spring first grade), this section concentrates on the differences children demonstrate in recognizing words by sight (sight words), words in context, addition and subtraction, multiplication and division in the spring of first grade.[15] Females are more likely to recognize words by sight and to understand words in context than males. There is no difference by sex in terms of addition and subtraction; but in the spring of first grade, males are more likely than females to solve problems that require multiplication and division. So, while there are no overall differences by sex of the child, in the spring of first grade females are more likely to have mastered complex reading skills; whereas, males are more likely to have mastered complex mathematics skills.[16]

[15] For a more detailed analysis of children's reading and mathematics knowledge and skills at the beginning of kindergarten and across the kindergarten year, refer to *America's Kindergartners* (West et al. 2000) and *The Kindergarten Year* (West et al. 2001).
[16] An existing analysis based on the ECLS-K explores the possible sex and age interaction associated with the scholastic performance of young children during kindergarten. The analysis revealed no significant interactions (Reaney, West, and Denton, 2000).

When considering the poverty status of children's families during the kindergarten year, first-graders from nonpoor families are more likely to recognize words by sight than first-graders from poor families. The same is true for addition and subtraction. Moreover, about twice as many first-graders from nonpoor families are proficient at understanding words in context and performing multiplication and division (the more complex skills) as first-graders from poor families (tables 1 and 2).

Differences by children's race/ethnicity are also apparent. White children are more likely than Black or Hispanic children to recognize words by sight, understand words in context, solve addition and subtraction problems, and solve multiplication and division problems. Asian children are more likely than Black or Hispanic children to recognize words by sight, understand words in context, and solve multiplication and division problems. In the spring of first grade, Hispanic children are more likely than Black children to demonstrate proficiency in these particular reading and mathematics areas[17] (tables 1 and 2).

The differences in specific knowledge and skills by school type echo the differences described above in children's overall reading and mathematics scores. In the spring of first grade, children who attended private school during their kindergarten year are more likely than children who attended public school during their kindergarten year to demonstrate proficiency in sight words, words in context, addition and subtraction, and multiplication and division. They were also more likely to be proficient in these skills when they entered kindergarten (tables 1 and 2).

What is the relationship between children's early literacy, approaches to learning, and general health status as they enter kindergarten and their spring kindergarten and first grade reading and mathematics achievement?

In order to answer this question, this section of the report examines three sets of relationships: (1) the relationship of children's reading and mathematics literacy at kindergarten entry to their spring kindergarten and first grade achievement; (2) the relationship of children's approaches to learning at kindergarten entry to their spring kindergarten and first grade achievement; and (3) the relationship of

[17] This finding should be interpreted in context. In order to be fairly assessed, children needed to demonstrate a basic proficiency in English. Thus, some Hispanic children were excluded from the assessment and the estimate does not reflect the entire population of Hispanic children in the sample.

children's general health at kindergarten entry to their spring kindergarten and first grade achievement (see table 5 for information on children's literacy, approaches to learning, and general health).

Children's spring kindergarten and spring first grade reading and mathematics achievement is presented in two ways. First, children's spring kindergarten and spring first grade overall reading and mathematics achievement (i.e., t-scores) is examined by children's early literacy, approaches to learning, and general health status as they began kindergarten. In addition to reporting children's mean t-scores, the percentage of children scoring in each quartile of the t-score distribution (i.e., lowest 25 percent, 26–50 percent, 51–75 percent, 76–100 percent) is reported. Oftentimes, the greatest differences are at the tails of the distribution (e.g., lowest 25 percent, highest 25 percent) (see West et al. 2000). Second, information on the percentage of children who demonstrated specific reading and mathematics skills in the spring of kindergarten and the spring of first grade are examined by children's early literacy, approaches to learning, and general health status.

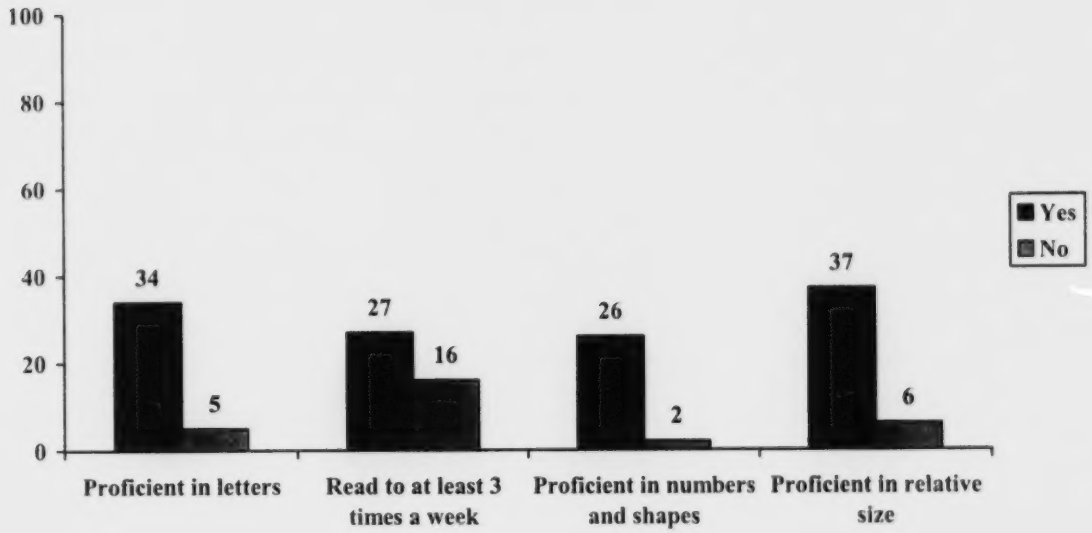
Literacy

Children who recognize their letters, who are read to at least three times a week, who recognize their basic numbers and shapes and demonstrate an understanding of the mathematical concept of relative size as they enter kindergarten demonstrate significantly higher reading knowledge and skills in the spring of kindergarten and the spring of first grade than children who do not have these resources (i.e., the former's t-scores are as much as a full standard deviation higher) (table 6). Further, children who recognize their letters at kindergarten entry are significantly more likely than children who cannot recognize their letters to score in the top 25 percent of children in reading in the spring of kindergarten and the spring of first grade. In fact, 35 percent of children who could recognize their letters at the start of kindergarten scored in the top 25 percent in the spring of kindergarten, versus only 2 percent of children who could not recognize their letters at kindergarten entry. A similar pattern is true in the spring of first grade (34 percent versus 5 percent, respectively) (table 6).

Being read to at least three times a week prior to entering kindergarten and being proficient at recognizing numbers and relative size at kindergarten entry also relate to children's spring kindergarten and first grade reading achievement. Those who are read to at least three times a week are almost twice as likely to score in the top 25 percent in reading than children read to less than three times a week (for spring kindergarten, 27 percent versus 14 percent; for spring first grade, 27 percent versus 16 percent). Also, children who are proficient in their numbers and shapes and the mathematical concept of relative size are more likely to score in the top 25 percent in reading than those who do not possess these skills as they enter kindergarten (for spring kindergarten proficiency in numbers and shapes, 26 percent versus 1 percent; relative size, 37

percent versus 5 percent; for spring first grade proficiency in numbers and shapes, 26 percent versus 2 percent; relative size, 37 percent versus 6 percent) (figure 3, table 6).

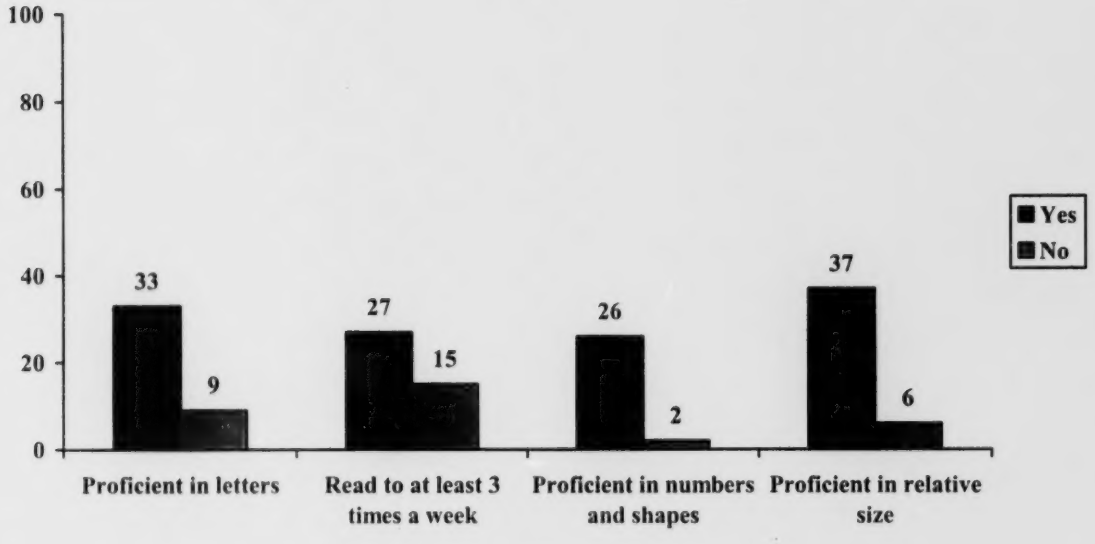
Figure 3.—Of first-graders scoring in the top 25 percent in reading, the percentage who, at kindergarten entry, can recognize the letters of the alphabet, who are read to at least three times a week by a family member, who are proficient in numbers and shapes, and who are proficient in relative size: Spring 2000



NOTE: Estimates reflect children assessed in English in all three rounds of data collection and who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Base Year Public-Use and First Grade Restricted-Use data files.

Children's ability to recognize their letters as they begin kindergarten, the fact that they are read to at least three times a week as they enter kindergarten, their ability to recognize basic numbers and shapes, and their understanding of the mathematical concept of relative size all relate to their spring kindergarten and first grade mathematics achievement. Children who have these resources score significantly higher in mathematics in the spring of kindergarten and the spring of first grade (i.e., a higher mathematics t-score) than their peers who do not have these skills. Once again, this difference is as much as one standard deviation higher than those children who do not have these resources. In terms of the test score distribution, students with these resources are significantly more likely to score in the top 25 percent in both the spring of kindergarten and first grade than children without these resources (figure 4, table 7).

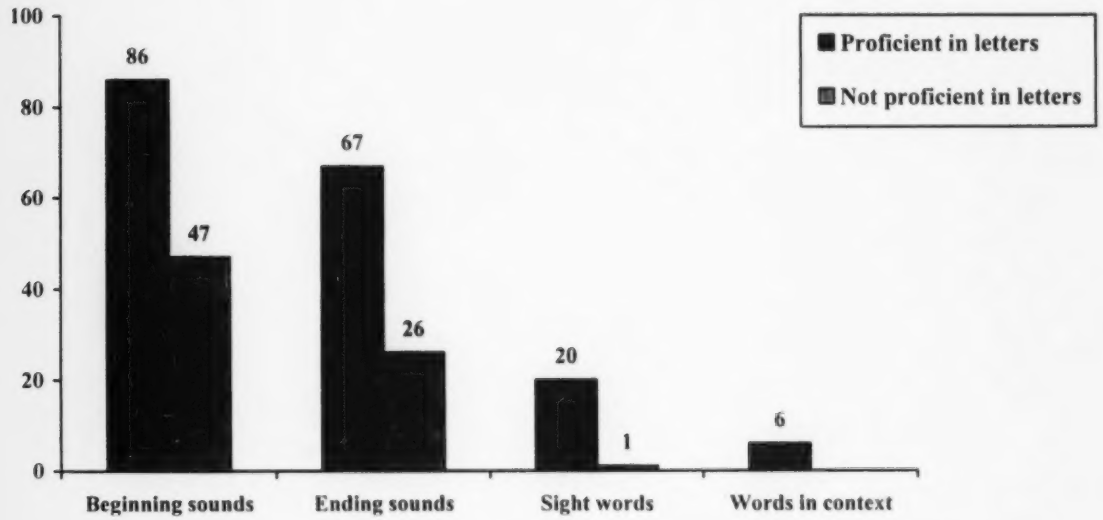
Figure 4.—Of first-graders scoring in the top 25 percent in mathematics, the percentage who, at kindergarten entry, can recognize the letter of the alphabet, who are read to at least three times a week by a family member, who are proficient in numbers and shapes, and proficient in relative size: Spring 2000



NOTE: Estimates reflect children assessed in English in all three rounds of data collection and who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Base Year Public-Use and First Grade Restricted-Use data files.

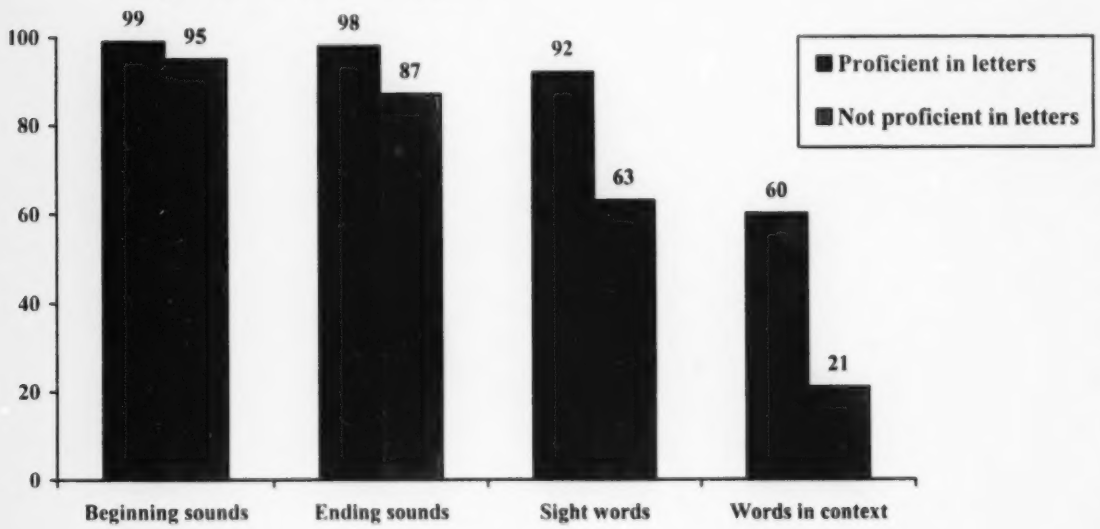
Another way to think about how certain resources of children relate to their spring achievement is in terms of their acquisition of *specific* reading and mathematics knowledge and skills. Whether or not certain groups of children acquire certain skills or sets of skills may be more easily understood than differences in standardized test scores. At the spring of the kindergarten year, children who could recognize their letters at the start of kindergarten are about twice as likely (86 percent and 47 percent, respectively) to understand the letter-sound relationship at the beginning of words, and are about three times as likely (67 percent and 26 percent, respectively) to understand the letter-sound relationship at the ending of words as children who could not recognize their letters when they started kindergarten. In terms of their first grade skills, children who could recognize their letters when they started kindergarten are more likely than children who could not recognize words by sight and words in context by the spring of first grade (92 percent versus 63 percent, 60 percent versus 21 percent; respectively). A similar relationship is found for spring kindergarten and first grade mathematics skills (e.g., children who could recognize their letters as they entered kindergarten are more likely than children who could not demonstrate specific mathematical skills—ordinality/sequence, addition/subtraction, and multiplication/division—in the spring of kindergarten and the spring of first grade (table 9).

Figure 5.—Percentage of children demonstrating specific reading knowledge and skills in the spring of kindergarten by whether they were proficient in recognizing their letters at kindergarten entry: Spring 1999



NOTE: Estimates reflect children assessed in English in all three rounds of data collection and who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Base Year Public-Use and First Grade Restricted-Use data files.

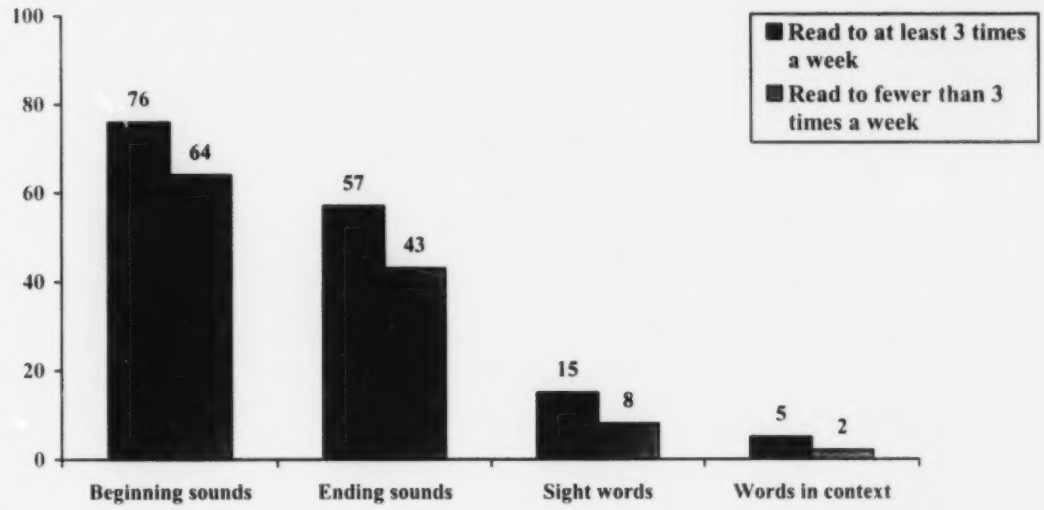
Figure 6.—Percentage of children demonstrating specific reading knowledge and skills in the spring of first grade by whether they were proficient in recognizing their letters at kindergarten entry: Spring 2000



NOTE: Estimates reflect children assessed in English in all three rounds of data collection and who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Base Year Public-Use and First Grade Restricted-Use data files.

Children who were read to at least three times a week as they entered kindergarten are more likely to have mastered the letter-sound relationship at the beginning and ending of words before they leave kindergarten than children who are not read to at least three times a week (figure 7). Further, children who were read to at least three times a week as they entered kindergarten are more likely to understand words when presented in context in both the spring of kindergarten and the spring of first grade than children who are not read to at least three times a week (table 8). A similar pattern is found for children's spring kindergarten and first grade specific mathematics knowledge and skills (table 9).

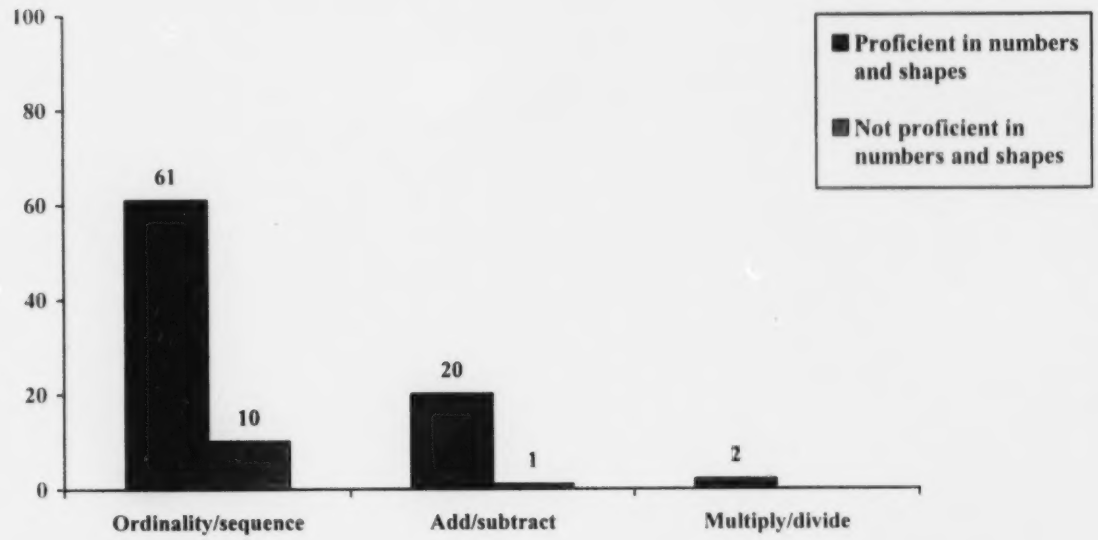
Figure 7.—Percentage of children demonstrating specific reading knowledge and skills in the spring of kindergarten by how often they were read to by a family member at kindergarten entry: Spring 1999



NOTE: Estimates reflect children assessed in English in all three rounds of data collection and who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Base Year Public-Use and First Grade Restricted-Use data files.

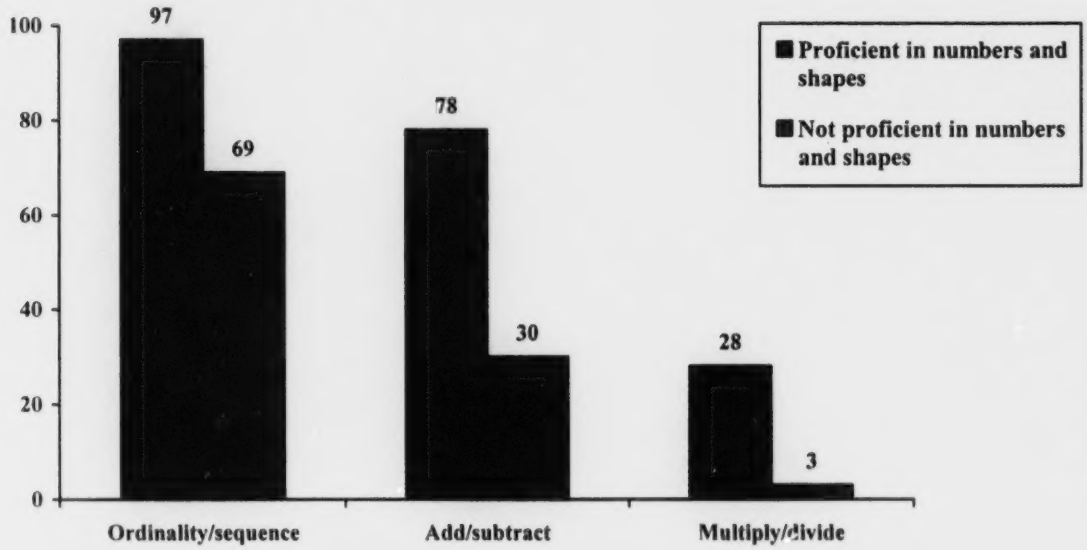
Children who could recognize their basic numbers and shapes and understood the mathematical concept of relative size when they entered kindergarten are more likely to acquire more advanced specific reading and mathematics skills later on. For example, children who recognized their basic numbers and shapes and understood the mathematical concept of relative size as they entered kindergarten were more likely than children who had not mastered these skills to understand ordinality/sequence by the spring of kindergarten and the spring of first grade (figure 8, table 9). By the spring of first grade, children who recognized their basic numbers and shapes and understood the mathematical concept of relative size as they entered kindergarten are more than two times as likely to be proficient in addition and subtraction and multiplication and division (figure 9, table 9). A similar relationship is found for spring kindergarten and first grade reading skills (table 8).

Figure 8.—Percentage of children demonstrating specific mathematics knowledge and skills in the spring of kindergarten by whether they were proficient in recognizing their numbers and shapes at kindergarten entry: Spring 1999



NOTE: Estimates reflect children assessed in English in all three rounds of data collection and who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Base Year Public-Use and First Grade Restricted-Use data files.

Figure 9.—Percentage of children demonstrating specific mathematics knowledge and skills in the spring of first grade by whether they were proficient in recognizing their numbers and shapes at kindergarten entry: Spring 2000



NOTE: Estimates reflect children assessed in English in all three rounds of data collection and who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Base Year Public-Use and First Grade Restricted-Use data files.

Approaches to Learning

As children enter kindergarten for the first time, about three in five (58 percent) often to very often exhibit behaviors associated with a positive approach to learning (e.g., show eagerness to learn, persist at tasks), according to their teachers (table 5). A positive approach to learning is part of a successful learning experience. Children who frequently exhibit a positive approach to learning as they begin kindergarten do better in spring kindergarten and first grade reading and mathematics than children who exhibit these behaviors less frequently (i.e., the former have higher mean t-scores). Moreover, children who frequently exhibit a positive approach to learning are more than twice as likely as other children to score in the top 25 percent in reading and mathematics at the spring of kindergarten and first grade (tables 7 and 8).

In terms of children's specific reading skills, children who frequently demonstrate behaviors associated with a positive approach to learning as they enter kindergarten are more likely than children who less frequently demonstrate such a positive approach to learning to understand the letter-sound relationship at the beginning and ending of words as they are completing kindergarten, and are more likely to master

sight words and words in context as they are completing first grade (table 8). A similar pattern occurs in mathematics (table 9). Children who frequently demonstrate a positive approach to learning are more likely to have mastered the set of skills associated with ordinality/sequence by the spring of kindergarten (70 versus 43 percent, respectively). And by the spring of first grade, these children are more likely than other children to be proficient in addition and subtraction and multiplication and division (84 versus 64 percent, 34 versus 16 percent; respectively) (table 9).

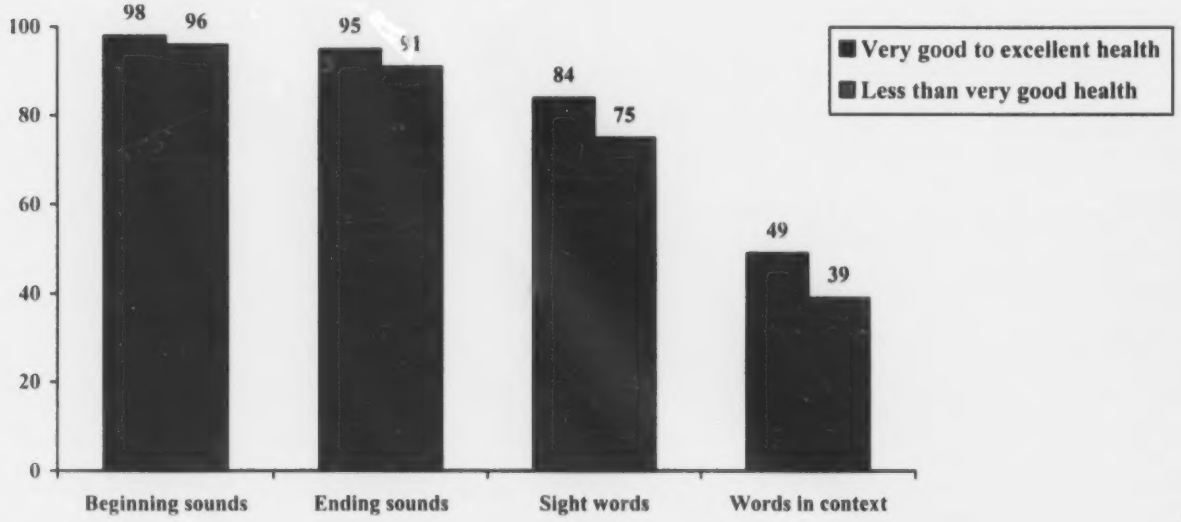
General Health

Young children learn, in part, through active engagement. Therefore, it is important for them to be generally healthy. At kindergarten entry, 85 percent of children are rated as being in very good to excellent health by their parents. Also, these children demonstrate higher reading and mathematics knowledge and skills in the spring of kindergarten and the spring of first grade than children who are rated as being in less than very good health (i.e., they have significantly higher t-scores). Children reported to be in very good to excellent health as they enter kindergarten ("healthier children") are more likely to score in the top 25 percent in reading and mathematics in the spring of kindergarten and the spring of first grade than children in less than very good health.

Further, healthier children are more likely than children in less than very good health to understand the letter-sound relationship at the beginning and ending of words by the spring of kindergarten. Healthier children are also more likely than children in less than very good health to recognize words by sight and understand words in context by the spring of first grade (figure 10, table 8).

Children's general health also relates to their mathematics achievement. Children reported to be in very good to excellent general health as they enter kindergarten are more likely to demonstrate greater proficiency in ordinality/sequence and addition/subtraction by the spring of kindergarten than children in less than very good health. Also, by the spring of first grade, healthier children are more likely to be proficient in addition and subtraction and multiplication and division than children who are in less than very good health when they started kindergarten.

Figure 10.—Percentage of children demonstrating specific reading knowledge and skills in the spring of first grade by their general health status at kindergarten entry: Spring 2000



NOTE: Estimates reflect children assessed in English in all three rounds of data collection and who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999. Children's health status is based on parental report at the time children are entering kindergarten.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Base Year Public-Use and First Grade Restricted-Use data files.

Effects of Beginning Resources when Controlling for Other Factors

When explored in a simple descriptive manner, significant relationships exist between the resources children possess at kindergarten entry (i.e., early literacy, approaches to learning, and general health) and their spring kindergarten and spring first grade reading and mathematics performance. However, it is also important to recognize the potential influence of factors such as poverty and race/ethnicity on these relationships. The relationships between the resources children possess at kindergarten entry and their spring kindergarten and spring mathematics performance are still significant after controlling for the influence of children's poverty status and their race/ethnicity (see appendix for regression tables).

Summary

As children enter kindergarten for the first time, they bring with them different sets of knowledge and skills. Some children can already recognize the letters of the alphabet and others know their numbers and shapes. The knowledge and skills they bring with them, together with the development of their reading

and mathematics knowledge and skills across the early years of school (i.e., kindergarten and first grade), potentially lays the foundation for their later learning and school experiences.

Some of the differences in children's reading and mathematics knowledge and skills by child, family, and school characteristics that are present as they enter kindergarten persist into the spring of kindergarten and the spring of first grade. For example, poor children consistently score below the national average in both reading and mathematics across the kindergarten year and into the spring of first grade. These results also suggest differences that are beginning to emerge by children's sex. By the spring of first grade, females are more likely to be reading—that is, understanding words in context; whereas, males are more likely to be proficient at advanced mathematics—that is, multiplication and division. However, some differences do seem to wane. For example, in both reading and mathematics, Hispanic children's scores tend to move upward toward the national mean over these two school years. The longitudinal nature of the ECLS-K will enable researchers to track these differences in terms of children's third and fifth grade reading and mathematics performance.

Children who bring certain knowledge and skills with them to kindergarten are likely to be at an advantage in classroom learning compared to their peers who do not possess these resources. The descriptive analyses in this report show that children who have specific cognitive knowledge and skills, are read to frequently, possess positive approaches to learning, and enjoy very good or excellent general health perform better in reading and mathematics than those who do not have these resources. However, it is also important to appreciate that the relationship of these resources to children's reading and mathematics achievement across kindergarten and first grade were explored without controlling for other possible intervening factors, such as the poverty status of the family. Yet, even when the basic relationship of these resources to children's reading and mathematics achievement across kindergarten and first grade were explored while controlling for the family's poverty status and children's race/ethnicity, significant relationships still existed.

The descriptive analyses included in this report are intended to address certain hypotheses in the research concerning early childhood development (e.g., children who are read to frequently do better). At the same time, the analyses are intended to point to the need for more complex models. Such models would explore the direct and indirect effects of children's beginning kindergarten knowledge and skills to their later achievement. Specifically, it is important for researchers and policymakers to understand what works for which children. Therefore, future analyses will consider the experiences of poor minority children versus nonpoor minority children, or poor children who are read to frequently versus nonpoor children who are read to frequently. Finally, a deeper understanding of why some children demonstrate and possess early

literacy skills, approaches to learning, and sound general health as they enter kindergarten and others do not—and the ways in which schools and teachers build upon these resources—is warranted.

This third report from the ECLS-K, in conjunction with *America's Kindergartners* and *The Kindergarten Year*, provides descriptive information on young children's achievement across kindergarten and first grade. The ECLS-K will continue to follow these children into third and fifth grades. The study will provide researchers not only with an understanding of how children's early literacy, approaches to learning, and general health status as they enter kindergarten shape their later achievement but also how these resources need to be maintained and further developed for continued scholastic success. Moreover, future reports based on the ECLS-K will explore the potential influences of specific classroom and school factors (e.g., class size, full-day and part-day kindergarten programs, teacher characteristics, school environment) and additional home influences (e.g., parenting style, parent involvement) on children's scholastic success. The valuable information collected through this study will help us better understand the early education and elementary school experience of our nation's children.

Methodology and Technical Notes

Survey Methodology

The Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), is being conducted by Westat for the U.S. Department of Education, National Center for Education Statistics (NCES). It is designed to provide detailed information on children's early school experiences. The study began in the fall of the 1998–99 school year. The children participating in the ECLS-K are being followed longitudinally through the fifth grade. Estimates in this report are based on data collected from and about children who entered kindergarten for the first time in the fall of 1998, who were promoted on time to first grade in the fall of 1999, and who were assessed in English in the fall and spring of kindergarten and the spring of first grade.

Sample Design

A nationally representative sample of 22,782 children enrolled in 1,277 kindergarten programs during the 1998–99 school year was selected to participate in the ECLS-K. The children attended both public and private kindergartens that offered full-day and part-day programs. The sample includes children from different racial/ethnic and socioeconomic backgrounds, and includes oversamples of Asian children, private kindergartens, and private kindergartners.

Sampling for the ECLS-K involved a dual-frame, multistage sampling design. The first stage of sampling involved the selection of 100 primary sampling units (PSU) from a national sample of PSUs. The PSUs were counties and county groups. Public and private schools were then selected within the PSUs, and children were sampled from the selected schools. Public schools were selected from the Common Core of Data, a public school frame, and private schools were selected from a private school frame developed from the Private School Survey.[18] Approximately 23 kindergartners were selected on average in each of the sampled schools. In the spring of first grade, the sample was freshened to reflect children who did not attend kindergarten during the 1998–99 school year. While all students still enrolled in their base-year schools were recontacted, only a 50 percent subsample of base-year students who had transferred from their kindergarten school was followed. For information on freshening procedures and subsampling of transfer children (i.e., movers), refer to the *ECLS-K First Grade Public-Use Data Files User's Manual.* Fall kindergarten data were obtained from September to December 1998. Spring kindergarten data were obtained from March to June 1999. Spring first grade data were obtained from March to July 2000.

[18] During the spring of 1998, Westat identified new schools that were not found on either frame. A sample of these schools was included in the ECLS-K school sample.

Response Rates

A total of 944 of the 1,277 originally sampled schools participated during the base year of the study. This translates into a weighted response rate of 74 percent for the base year of the study. The school response rate during the spring of the base year (74.2 percent) was higher than during the fall (69.4 percent), due to some of the schools that originally declined to participate deciding to participate in the spring. Nearly all (99.4 percent) of the schools that participated in the fall of the base year also participated in the spring.

The child base-year completion rate was 92 percent (i.e., 92 percent of the children were assessed at least once during kindergarten). The parent base-year completion rate was 89 percent (i.e., a parent interview was completed at least once during kindergarten). Thus, the overall base-year response rate for children was 68.1 percent (74 percent x 92 percent) and the base-year response rate for the parent interview was 65.9 percent (74 percent x 89 percent). About 95 percent of the children and 94 percent of the parents who participated in the fall of kindergarten also participated in the spring. About 88 percent of the children and 85 percent of the parents who were eligible for the spring first grade collection participated.

For information on the nonresponse bias analysis, refer to the *ECLS-K Base Year Public-Use Data Files User's Manual,* the *ECLS-K First Grade Public-Use Data Files User's Manual* and/or the *ECLS-K Methodology Report*. Findings from these analyses suggest that there is not a bias due to nonresponse.

Data Reliability

Estimates produced using data from the ECLS–K are subject to two types of error, sampling and nonsampling errors. Nonsampling errors are errors made in the collection and processing of data. Sampling errors occur because the data are collected from a sample rather than a census of the population. A detailed discussion of these types of errors can be found in *America's Kindergartners* (West et al. 2000).

Standard Errors and Weights

In order to produce national estimates from the ECLS-K data collected during the kindergarten and first grade year, the sample data were weighted. Weighting the data adjusts for unequal selection probabilities at the school and child levels and adjusts for school, child, teacher, and parent nonresponse. The first stage of the weighting process assigns weights to the sampled primary sampling units (PSUs) equal to the

inverse of the PSU probability of selection.[19] The second stage of the weighting process assigns weights to the schools sampled within PSUs. The base weight for each sampled school is the PSU weight multiplied by the inverse of the probability of selecting the school. The base weights for eligible schools are adjusted for nonresponse. These adjustments are made separately for public and private schools.

The base weight for each child in the sample is the school nonresponse adjusted weight for the school the child attends, multiplied by a post-stratified within-school student weight (total number of students in the school, divided by the number of students sampled in the school). The parent panel weight (P124W0), which is the weight used to produce the estimates found in this report, is the base child weight adjusted for nonresponse to the parent interview at each round of data collection. Only those cases with completed parent interviews in both fall and spring of kindergarten and spring of first grade are included in these weighting procedures. Again, these adjustments are made separately for public and private schools. This weight sums to the population of all children who attended kindergarten in the fall of 1998.

In addition to properly weighting the responses, special procedures for estimating the statistical significance of the estimates were employed, because the data were collected using a complex sample design. Complex sample designs, like that used in the ECLS-K, result in data that violate the assumptions that are normally required to assess the statistical significance of the results. Frequently, the standard errors of the estimates are larger than would be expected, if the sample was a simple random sample and the observations were independent and identically distributed random variables.

Replication methods of variance estimation were used to reflect the actual sample design used in the ECLS-K. A form of the jackknife replication method (JK2) using 90 replicates was used to compute approximately unbiased estimates of the standard errors of the estimates in the report, using WesVarPC. The jackknife methods were used to estimate the precision of the estimates of the reported national percentages and means.

Statistical Procedures

Comparisons made in the text were tested for statistical significance to ensure that the differences are larger than might be expected due to sampling variation. When comparing estimates at one point in time (e.g., fall kindergarten) were made between categorical groups (i.e., gender, race/ethnicity, school type

[19] The approach used to develop weights for the ECLS-K is described in the *ECLS-K User's Manual* and the *ECLS-K Methodology Report*.

and program type), *t* statistics were calculated. The formula used to compute the *t* statistic was:

$$t = Est_1 - Est_2 / SQRT[(se_1)^2 + (se_2)^2]$$

Where Est_1 and Est_2 are the estimates being compared and se_1 and se_2 are their corresponding standard errors.

When comparing an estimate for a particular subgroup of children (e.g., poor children) to the mean for all children, the following formula was used:

$$(Est_{sub} - Est_{tot}) / SQRT\ (se^2_{tot} + se^2_{sub} - 2*p*se^2_{sub})$$

Where Est is the estimate, se is the standard error, sub and tot are subscripts denoting the subgroup and total, and p is the proportion of the sample that is in the subgroup being compared.

To guard against errors of inference based on multiple comparisons, the Bonferroni procedure was used to correct significance tests for multiple contrasts. The Bonferroni procedure divides the alpha level for a single *t* test (e.g., .05) by the number of critical pairwise comparisons, in order to provide a new alpha that adjusts for the number of comparisons being made.

Constructs and Variables Used in Analysis

Children's Cognitive Knowledge and Skills

Reading and Mathematics

The ECLS-K direct child cognitive assessment was administered using a computer-assisted personal interview (CAPI), administered one-on-one with each child. The assessment included two cognitive domains (reading and mathematics). The ECLS-K battery used a two-stage assessment approach, in which the first stage in each domain contained a routing test that determined a child's approximate skills. According to the child's performance on the routing test, the child was administered the appropriate skill level assessment for that domain (the second stage). The reading and mathematics assessments had three skill levels. In each round, children were administered the routing stage and the appropriate skill level stage in the fall of kindergarten, the spring of kindergarten, and the spring of first grade.

To be sensitive to the needs and capabilities of the children in the sample, an English language proficiency screener, called the Oral Language Development Scale (OLDS), was administered if school records indicated that the child's home language was not English. The child had to demonstrate a certain

level of English proficiency to be administered the cognitive assessment in English. The cognitive knowledge and skills estimates in this report are based on those first-time kindergartners who were assessed in English in both the fall and the spring of kindergarten, and the spring of first grade. For the analytic sample utilized in this report, in terms of English assessment status by race/ethnicity, approximately 68 percent of Hispanic children and 78 percent of Asian children were assessed in English in fall and spring of kindergarten and spring of first grade.

Scale scores. Item Response Theory (IRT) was employed to calculate scores that could be compared regardless of which second stage form a student completed. The items in the routing test, plus a core set of items shared among the different second stage forms, made it possible to establish a common scale. IRT uses the pattern of right, wrong, and omitted responses to the items actually administered in a test, and the difficulty, discriminating ability, and "guess-ability" of each item, to place each student on a continuous ability scale. It is then possible to estimate the score the student would have achieved if all of the items in all of the test forms had been administered. The reliability of the estimates of reading and mathematics, fall and spring kindergarten and spring first grade scores, are as follows (IRT-based theta): reading = .9, mathematics = .9. The standardized scores used in this report are transformations of the IRT theta (ability) estimates, rescaled to a mean of 50 and standard deviation of 10 using cross-sectional sample weights for fall and spring kindergarten and spring first grade.

Proficiency level probability scores. Proficiency scores provide a means of distinguishing status or gain in specific skills within a content area from the overall achievement measured by the IRT scale scores. Clusters of four test questions having similar content and difficulty were included at several points along the score scale of the reading and mathematics tests. A student was assumed to have mastered a particular level of proficiency, if at least three of the four items in the cluster were answered correctly, and to have failed at this level, if two or more items were wrong. Clusters of items provide a more reliable test of proficiency than do single items, because of the possibility of guessing. It is very unlikely that a student who has not mastered a particular skill would be able to guess enough answers correctly to pass a four-item cluster. The nature of the two-stage test is that not all children receive all items. To calculate proficiency estimates for all children, an IRT model was employed. For the purpose of IRT calibration, the item clusters were treated as single items. The hierarchical nature of the skill sets justified the use of the IRT model in this way. Gains in probability of mastery at each proficiency level allow researchers to study not only the amount of gain in total scale score points but also where along the scale different children are making their largest gains in achievement during a particular time interval.

In reading, the proficiency levels are named as follows: (1) letter recognition, (2) beginning sounds, (3) ending sounds, (4) sight words, and (5) words in context. *Letter recognition* is as it sounds—the ability of

children to recognize their letters. *Beginning sounds* and *ending sounds* refer to children's ability to understand the letter-sound relationship at the beginning and at the ending of words. *Sight words* refers to children's ability to recognize whole words by sight and read them aloud. *Words in context* refers to children's ability to read simple short passages of text with a missing word, and insert the correct missing word.

In mathematics, the proficiency levels are named as follows (their names reflect the most complex mathematical construct contained in the proficiency): (1) number and shape, (2) relative size, (3) ordinality and sequence, (4) add/subtract, and (5) multiply/divide. *Number and shape* refers to children's ability to recognize single-digit numbers and basic shapes. *Relative size* refers to children's ability to count beyond 10, recognize the sequence in basic patterns, and compare the relative size of objects. *Ordinality and sequence* means that children can recognize two-digit numbers, identify the next number in a sequence, and identify the ordinal position of an object. *Addition and subtraction* means children can perform simple addition and subtraction problems. *Multiplication and division* refers to children's ability to perform simple multiplication and division operations. The addition, subtraction, multiplication, and division items are presented in the form of word problems with picture support and in numerical statements.

Children's Approaches to Learning

For each ECLS-K sample child they taught the teachers completed a child-specific questionnaire that collected information on the child's social knowledge and skills. Teachers reported on the frequency with which children demonstrated particular behaviors (e.g., approaches to learning). Teachers rated the frequency of children's behaviors as *never*, *sometimes*, *often,* or *very often*. To present the behaviors in terms of their basic frequency (e.g., frequent versus infrequent), the categories were collapsed into *never/sometimes* and *often/very often*. Teachers completed these ratings in the fall and spring of kindergarten and the spring of first grade. This report uses information from the fall of kindergarten (split half reliability coefficient = .9).

Family and Child Characteristics

Reading to Children, Children's General Health, and Family Demographic Characteristics

Parents/guardians were asked to provide key information about their children on subjects such as family demographics (e.g., age, family members, relation to child, race/ethnicity), family structure (household members and composition), parent involvement, home educational activities (e.g., reading to the child), child health, parental education and employment status, and child's social skills and behaviors. Specifically, parents were asked how often in a given week a family member reads to the child.

Responses ranged from *not at all*, *once or twice a week*, *3 to 6 times a week* and *every day*. Parents also provided information on the general health of their child. Parents rated their children's general health as *poor*, fair, *good*, *very good* and *excellent*. Most of the data were collected through a computer-assisted telephone interview (CATI), although some of the interviews were collected through a computer-assisted personal interview (CAPI), when respondents did not have a telephone or were reluctant to be interviewed by telephone. Parents/guardians were interviewed in the fall and spring of kindergarten and the spring of first grade.

Derived Variables

A number of variables used in this report were derived by combining information from one or more questions in the ECLS-K parent questionnaire or from other study sources. The derivation of key variables is described in this section.

Poverty status during the kindergarten year. This variable is a function of household income and family size. Income was compared to Census poverty thresholds, which vary by household size. Households whose income fell below the appropriate threshold were classified as poor. The thresholds were based on 1998 Census information, where a household of four with a total household income below $16,655 was considered to be in poverty. Prior to calculating poverty status, household income was imputed.

Children's race/ethnicity. The race/ethnicity composite was constructed from two parent-reported variables: ethnicity and race. New Office of Management and Budget guidelines were followed under which a respondent could select more than one race. Thus, each respondent had to identify whether the child was Hispanic, and then select one or more races. The following are the five composite race/ethnicity categories presented in this report: White non-Hispanic, Black non-Hispanic, Hispanic, Asian and other (which includes Pacific Islanders, American Indians, Alaska Natives, and multiracial children). When race/ethnicity differences are presented in this report, White refers to White, non-Hispanic and Black refers to Black, non-Hispanic.

School type during the kindergarten year. The type of school in which children attended kindergarten was collapsed into two broad categories: public and private. Private schools include those with both religious affiliations and nonreligious affiliations. Information from the school administrator questionnaire, along with school sample frame data, was used to create this variable. If there was no school administrator questionnaire, then school sample frame data were utilized.

First-time kindergartners. In the fall kindergarten parent interview, parents/guardians provided information on whether children were in kindergarten for the first time during the 1998–99 school year.

Grade level. Children's grade level was determined through information from the Field Management System (FMS). The FMS reflects information recorded by the field staff prior to the child assessment.

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Tables

Table 1.—Percentage of children demonstrating proficiency[1] in specific reading knowledge and skills, by school year, by child, family and school characteristics: 1998–99 and 2000

Characteristic	Letter recognition			Beginning sounds			Ending sounds			Sight words			Words in context		
	Fall K	Spring K	Spring 1	Fall K	Spring K	Spring 1	Fall K	Spring K	Spring 1	Fall K	Spring K	Spring 1	Fall K	Spring K	Spring 1
Total	67	95	100	31	74	98	18	54	94	3	14	83	1	4	48
Sex															
Male	64	94	100	28	71	97	16	52	93	3	12	80	1	4	45
Female	71	96	100	34	77	98	19	57	95	2	15	85	1	5	50
Poverty[2] status during kindergarten year															
Non-poor	72	96	100	35	78	98	20	59	96	3	16	86	1	5	52
Poor	46	89	99	13	56	95	6	35	88	#	5	67	#	1	27
Race/ethnicity															
White, non-Hispanic	74	97	100	36	80	99	21	60	96	3	16	88	1	5	53
Black, non-Hispanic	59	92	99	21	60	96	11	41	90	1	9	71	#	2	34
Hispanic	51	91	100	21	68	98	11	47	93	1	10	78	#	2	41
Asian	79	99	100	44	84	99	29	66	97	7	28	90	4	12	62
Other	52	91	99	22	64	95	13	44	90	2	10	73	1	4	36
School type during kindergarten year															
Public	65	95	100	28	72	98	16	52	94	2	12	82	1	4	45
Private	84	99	100	47	87	99	29	70	97	5	23	91	2	8	63

[1] In this report, the main approach to determining proficiency is to calculate the mean of a probability score in any given proficiency area (as seen in the table above). An alternative way to calculate proficiency (table 5) is to present the information in a dichotomous fashion, where proficiency is indicated by whether a child correctly answered a specific number of items in a given set. Therefore, the two estimates do not exactly match. For more information, see the *Methodology and Technical Notes* section.

[2] Poverty is a function of household size and household income. Based on 1998 Census information, where a household of four with a total income below $16,655 was considered to be poor.

Less than .5 percent.

NOTE: Estimates reflect children assessed in English in all three rounds of data collection, who entered kindergarten for the first time in the fall of 1998, and were promoted to first grade in the fall of 1999. The estimates in this report do not exactly match those found in previous reports based on the same data. This report uses a different weight in making the estimates, which is stricter in its response requirements and utilizes a slightly smaller sample of children. For more information, see the *Analytic Sample* section of this report.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Table 2.—Percentage of children demonstrating proficiency[1] in specific mathematics knowledge and skills, by school year, by child, family and school characteristics: 1998–99 and 2000

Characteristic	Numbers and shapes			Relative size			Ordinality/sequence			Add/subtract			Multiply/divide		
	Fall K	Spring K	Spring 1	Fall K	Spring K	Spring 1	Fall K	Spring K	Spring 1	Fall K	Spring K	Spring 1	Fall K	Spring K	Spring 1
Total	95	99	100	59	88	99	23	59	96	4	19	76	#	2	27
Sex															
Male	94	99	100	59	88	99	23	59	96	5	20	76	1	3	30
Female	95	99	100	59	89	99	21	58	96	3	18	75	#	2	24
Poverty[2] status during kindergarten year															
Non-poor	96	100	100	64	91	99	25	63	97	5	21	79	#	3	30
Poor	88	98	100	38	77	98	8	37	91	1	8	60	#	1	11
Race/ethnicity															
White, non-Hispanic	96	100	100	67	92	99	28	67	97	5	23	82	#	3	34
Black, non-Hispanic	91	99	100	43	78	98	9	38	91	1	8	59	#	#	10
Hispanic	91	99	100	45	84	99	13	48	95	2	12	72	#	1	19
Asian	97	100	100	69	91	99	33	67	97	9	28	79	1	6	34
Other	89	99	100	49	83	98	15	49	93	2	12	66	#	1	19
School type during kindergarten year															
Public	94	99	100	56	87	99	20	56	95	3	17	74	#	2	25
Private	98	100	100	74	95	100	35	74	99	8	29	86	1	5	37

[1] In this report, the main approach to determining proficiency is to calculate the mean of a probability score in any given proficiency area (as seen in the table above). An alternative way to calculate proficiency (as seen in table 5) is to present the information in a dichotomous fashion, where proficiency is indicated by whether a child correctly answered a specific number of items in a given set. Therefore, the two estimates do not exactly match. For more information, see the *Methodology and Technical Notes* section.

[2] Poverty is a function of household size and household income. Based on 1998 Census information, where a household of 4 people with a total income below $16,655.00 was considered to be poor.

Less than .5 percent.

NOTE: Estimates reflect children assessed in English in all three rounds of data collection, who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999. The estimates in this report do not exactly match those found in previous reports based on the same data. This report uses a different weight in making the estimates, which is stricter in its response requirements and utilizes a slightly smaller sample of children. For more information, see the *Analytic Sample* section of this report.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Table 3.- -Children's mean reading t-scores, by school year, by child, family and school characteristics: 1998–99 and 2000

Characteristic	Fall kindergarten	Spring kindergarten	Spring first grade
Total	51	51	51
Sex			
Male	50	50	51
Female	51	52	52
Poverty[1] status during kindergarten year			
Non-poor	52	52	53
Poor	45	46	47
Race/ethnicity			
White, non-Hispanic	52	53	53
Black, non-Hispanic	48	48	48
Hispanic	47	49	50
Asian	55	55	55
Other	47	48	49
School type during kindergarten year			
Public	50	51	51
Private	55	55	55

[1] Poverty is a function of household size and household income. Based on 1998 Census information, where a household of four with a total income below $16,655 was considered to be poor.

NOTE: Estimates reflect children assessed in English in all three rounds of data collection, who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999. The estimates in this report do not exactly match those found in previous reports based on the same data. This report uses a different weight in making the estimates, which is stricter in its response requirements and utilizes a slightly smaller sample of children. For more information, see the *Analytic Sample* section of this report.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Table 4.—Children's mean mathematics t-scores, by school year, by child, family and school characteristics: 1998–99 and 2000

Characteristic	Fall kindergarten	Spring kindergarten	Spring first grade
Total	51	52	52
Sex			
Male	52	52	52
Female	51	51	51
Poverty[1] status during kindergarten year			
Non-poor	53	53	53
Poor	46	46	47
Race/ethnicity			
White, non-Hispanic	54	54	54
Black, non-Hispanic	47	47	47
Hispanic	48	49	50
Asian	55	54	53
Other	48	49	49
School type during kindergarten year			
Public	51	51	51
Private	56	56	55

[1] Poverty is a function of household size and household income. Based on 1998 Census information, where a household of four people with a total income below $16,655 was considered to be poor.

NOTE: Estimates reflect children assessed in English in all three rounds of data collection, who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999. The estimates in this report do not exactly match those found in previous reports based on the same data. This report uses a different weight in making the estimates, which is stricter in its response requirements and utilizes a slightly smaller sample of children. For more information, see the *Analytic Sample* section of this report.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Table 5.—Percentage distribution of children by the resources they possess as they enter kindergarten: 1998

Resource	Has resource	Does not have resource
Proficient* in recognizing letters at kindergarten entry	69	31
Read to at least three times a week at kindergarten entry	82	18
Proficient* in recognizing numbers and shapes at kindergarten entry	95	5
Proficient* in understanding relative size at kindergarten entry	63	37
Demonstrates positive approaches to learning often to very often at kindergarten entry	58	42
In very good or excellent general health at kindergarten entry	85	15

* In this report, the main approach to determining proficiency is to calculate the mean of a probability score in any given proficiency area (see tables 1 and 2). An alternative way to calculate proficiency (see table 5) is to present the information in a dichotomous fashion, where proficiency is indicated by whether a child correctly answered a specific number of items in a given set (see table above). Therefore, the two estimates do not exactly match. For more information, see the *Methodology and Technical Notes* section.

NOTE: Estimates reflect children assessed in English in all three rounds of data collection, who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Table 6.—Children's mean reading t-scores and t-score quartile distributions, by school year, by the resources children possess at kindergarten entry: 1998–99 and 2000

Resource	Spring Kindergarten					Spring First Grade				
	Mean t-score	Percent distribution of t-score quartiles				Mean t-score	Percent distribution of t-score quartiles			
		0–25 percent	26–50 percent	51–75 percent	76–100 percent		0–25 percent	26–50 percent	51–75 percent	76–100 percent
Proficient* in recognizing letters at kindergarten entry										
Yes	55	11	23	30	35	55	14	23	29	34
No	44	55	28	14	2	46	50	30	15	5
Read to at least three times a week at kindergarten entry										
Yes	52	23	24	26	27	52	23	24	26	27
No	48	36	28	22	14	49	35	28	20	16
Proficient* in recognizing numbers and shapes at kindergarten entry										
Yes	52	22	25	26	26	52	22	25	26	26
No	38	78	18	3	1	39	75	16	7	2
Proficient* in understanding relative size at kindergarten entry										
Yes	55	11	21	31	37	55	12	22	29	37
No	45	49	31	15	5	46	47	29	18	6
Demonstrates positive approaches to learning often to very often at kindergarten entry										
Yes	54	16	23	28	34	54	16	24	28	33
No	48	38	29	20	13	49	38	27	21	14
In very good or excellent general health at kindergarten entry										
Yes	52	24	24	26	26	52	24	25	26	26
No	49	33	28	20	19	49	33	26	22	19

* In this report, the main approach to determining proficiency is to calculate the mean of a probability score in any given proficiency area (see tables 1 and 2). An alternative way to calculate proficiency (see table 5) is to present the information in a dichotomous fashion, where proficiency is indicated by whether a child correctly answered a specific number of items in a given set (see table above). Therefore, the two estimates do not exactly match. For more information, see the *Methodology and Technical Notes* section.

NOTE: Estimates reflect children assessed in English in all three rounds of data collection, who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999. Due to rounding, percentage distributions of t-score quartiles may not sum to 100.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Table 7.—Children's mean mathematics t-scores and t-score quartile distributions, by school year, by the resources children possess as they enter kindergarten: 1998–99 and 2000

Resource	Spring Kindergarten					Spring First Grade				
	Mean t-score	Percent distribution of t-score quartiles				Mean t-score	Percent distribution of t-score quartiles			
		0–25 percent	26–50 percent	51–75 percent	76–100 percent		0–25 percent	26–50 percent	51–75 percent	76–100 percent
Proficient* in recognizing letters at kindergarten entry										
Yes	55	13	24	29	34	54	16	23	28	33
No	45	50	28	16	6	47	44	28	19	9
Read to at least three times a week at kindergarten entry										
Yes	52	22	25	26	27	52	22	24	26	27
No	48	38	27	21	15	49	37	28	21	15
Proficient* in recognizing numbers and shapes at kindergarten entry										
Yes	52	22	26	26	26	52	22	25	26	26
No	37	83	13	3	1	38	78	15	5	2
Proficient* in understanding relative size at kindergarten entry										
Yes	56	8	23	32	38	55	11	22	31	37
No	45	53	29	14	4	46	49	29	16	6
Demonstrates positive approaches to learning often to very often at kindergarten entry										
Yes	54	15	23	28	34	54	15	24	29	33
No	48	39	28	21	12	48	39	27	20	14
In very good or excellent general health at kindergarten entry										
Yes	52	23	25	26	26	52	23	25	26	26
No	49	36	25	21	18	49	34	27	22	17

* In this report, the main approach to determining proficiency is to calculate the mean of a probability score in any given proficiency area (see tables 1 and 2). An alternative way to calculate proficiency (see table 5) is to present the information in a dichotomous fashion, where proficiency is indicated by whether a child correctly answered a specific number of items in a given set (see table above). Therefore, the two estimates do not exactly match. For more information, see the *Methodology and Technical Notes* section.

NOTE: Estimates reflect children assessed in English in all three rounds of data collection, who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999. Due to rounding, percentage distributions of t-score quartiles may not sum to 100.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Table 8.—Percentage of children demonstrating specific reading knowledge and skills, by school year, the resources children possess as they enter kindergarten: 1998–99 and 2000

Resource	Spring Kindergarten				Spring First Grade			
	Beginning sounds	Ending sounds	Sight words	Words in context	Beginning sounds	Ending sounds	Sight words	Words in context
Proficient* in recognizing letters at kindergarten entry								
Yes	86	67	20	6	99	98	92	60
No	47	26	1	#	95	87	63	21
Read to at least three times a week at kindergarten entry								
Yes	76	57	15	5	98	95	85	50
No	64	43	8	2	96	91	75	35
Proficient* in recognizing numbers and shapes at kindergarten entry								
Yes	77	56	14	5	99	96	85	50
No	25	12	1	#	83	68	34	9
Proficient* in understanding relative size at kindergarten entry								
Yes	87	69	21	7	100	98	93	62
No	52	30	2	#	95	88	66	23
Demonstrates positive approaches to learning often to very often at kindergarten entry								
Yes	83	64	19	6	99	97	90	57
No	62	40	6	1	96	90	72	34
In very good or excellent general health at kindergarten entry								
Yes	76	56	14	5	98	95	84	49
No	65	45	10	3	96	91	75	39

* In this report, the main approach to determining proficiency is to calculate the mean of a probability score in any given proficiency area (see tables 1 and 2). An alternative way to calculate proficiency (see table 5) is to present the information in a dichotomous fashion, where proficiency is indicated by whether a child correctly answered a specific number of items in a given set (see table above). Therefore, the two estimates do not exactly match. For more information, see the *Methodology and Technical Notes* section.

Less than .5 percent.

NOTE: Estimates reflect children assessed in English in all three rounds of data collection, who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Table 9.—Percentage of children demonstrating specific mathematics knowledge and skills, by school year, by the resources children possess as they enter kindergarten: 1998–99 and 2000

Resource	Spring Kindergarten			Spring First Grade		
	Ordinality, sequence	Add/subtract	Multiply/divide	Ordinality, sequence	Add/subtract	Multiply/divide
Proficient* in recognizing letters at kindergarten entry						
Yes	71	25	3	98	83	34
No	32	5	#	91	60	12
Read to at least three times a week at kindergarten entry						
Yes	61	20	3	96	78	29
No	46	11	1	93	67	17
Proficient* in recognizing numbers and shapes at kindergarten entry						
Yes	61	20	2	97	78	28
No	10	1	#	69	30	3
Proficient* in understanding relative size at kindergarten entry						
Yes	76	28	4	99	88	38
No	30	4	#	90	57	9
Demonstrates positive approaches to learning often to very often at kindergarten entry						
Yes	70	25	4	98	84	34
No	43	10	1	92	64	16
In very good or excellent general health at kindergarten entry						
Yes	61	20	2	96	77	28
No	48	14	2	92	68	19

* In this report, the main approach to determining proficiency is to calculate the mean of a probability score in any given proficiency area (see tables 1 and 2). An alternative way to calculate proficiency (see table 5) is to present the information in a dichotomous fashion, where proficiency is indicated by whether a child correctly answered a specific number of items in a given set (see table above). Therefore, the two estimates do not exactly match. For more information, see the *Methodology and Technical Notes* section.

Less than .5 percent.

NOTE: Estimates reflect children assessed in English in all three rounds of data collection, who entered kindergarten for the first time in the fall of 1998 and were promoted to first grade in the fall of 1999.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Standard Error Tables

Table 1a.—Standard errors for percentage of children demonstrating proficiency in specific reading knowledge and skills, by school year, by child, family and school characteristics: 1998–99 and 2000

Characteristic	Letter recognition			Beginning sounds			Ending sounds			Sight words			Words in context		
	Fall K	Spring K	Spring 1	Fall K	Spring K	Spring 1	Fall K	Spring K	Spring 1	Fall K	Spring K	Spring 1	Fall K	Spring K	Spring 1
Total	.86	.41	.05	.83	.91	.15	.57	.96	.27	.13	.50	.63	.06	.19	.93
Sex															
Male	.89	.56	.09	.84	.95	.20	.58	.95	.34	.20	.54	.71	.09	.24	.94
Female	1.15	.46	.06	1.05	1.05	.16	.73	1.12	.30	.15	.64	.76	.08	.27	1.15
Poverty status during kindergarten year															
Non-poor	.73	.30	.04	.83	.70	.10	.59	.82	.18	.15	.54	.48	.07	.22	.87
Poor	1.91	1.10	.18	.88	1.93	.43	.53	1.46	.79	#	.53	1.46	#	.20	1.36
Race/ethnicity															
White, non-Hispanic	.91	.34	.05	.99	.86	.11	.70	.98	.19	.17	.63	.52	.08	.26	.98
Black, non-Hispanic	1.93	.92	.22	1.47	1.87	.47	.94	1.67	.74	.28	.84	1.52	#	.30	1.66
Hispanic	2.25	1.27	.04	1.45	2.16	.22	.90	2.08	.47	.29	.93	1.34	#	.36	1.59
Asian	2.32	.57	.00	2.73	1.99	.17	2.21	2.50	.54	1.31	2.21	1.81	.84	1.52	3.06
Other	4.92	2.04	.44	3.18	4.27	.97	2.15	3.84	1.89	.71	1.65	4.02	.37	.89	3.43
School type during kindergarten year															
Public	.90	.47	.06	.83	1.03	.16	.56	1.07	.30	.14	.52	.70	.07	.20	1.00
Private	1.38	.24	.01	1.89	1.00	.17	1.44	1.38	.35	.54	1.44	.93	.28	.77	1.67

Standard error based on an estimate of less than .5 percent.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Table 2a.—Standard errors for percentage of children demonstrating proficiency in specific mathematics knowledge and skills, by school year, by child, family and school characteristics: 1998–99 and 2000

Characteristic	Numbers and shapes			Relative size			Ordinality/sequence			Add/subtract			Multiply/divide		
	Fall K	Spring K	Spring 1	Fall K	Spring K	Spring 1	Fall K	Spring K	Spring 1	Fall K	Spring K	Spring 1	Fall K	Spring K	Spring 1
Total	.29	.07	.02	.76	.52	.09	.67	.90	.29	.20	.53	.70	#	.14	.76
Sex															
Male	.39	.11	.02	.89	.60	.14	.85	.99	.34	.29	.66	.77	.09	.24	.95
Female	.29	.07	.02	.89	.55	.09	.73	1.09	.33	.19	.60	.78	#	.12	.80
Poverty status during kindergarten year															
Non-poor	.23	.05	.05	.66	.36	.08	.71	.71	.25	.23	.55	.54	#	.16	.76
Poor	.84	.19	.11	1.33	1.22	.25	.64	1.70	.71	.13	.62	1.62	#	.15	.87
Race/ethnicity															
White, non-Hispanic	.23	.04	.01	.77	.38	.08	.87	.85	.20	.30	.66	.55	#	.20	.90
Black, non-Hispanic	.71	.29	.08	1.58	1.27	.38	.74	1.55	.95	.12	.58	1.92	#	.07	.83
Hispanic	.73	.18	.01	1.79	1.27	.14	1.08	2.06	.79	.22	.98	1.28	#	.23	1.27
Asian	.69	.24	.00	2.54	1.31	.12	2.33	3.06	.76	1.43	1.95	2.86	.28	1.00	2.72
Other	2.35	.39	.02	4.18	2.36	.55	2.54	3.21	1.40	.59	1.54	2.78	#	.39	2.30
School type during kindergarten year															
Public	.32	.08	.07	.84	.60	.11	.68	1.02	.34	.19	.58	.79	#	.14	.84
Private	.32	.07	.02	1.27	.52	.08	1.52	1.34	.28	.67	1.17	.90	.14	.48	1.42

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Table 3a.—Standard errors for children's mean reading t-scores, by school year, by child, family and school characteristics: 1998–99 and 2000

Characteristic	Fall kindergarten	Spring kindergarten	Spring first grade
Total	.23	.25	.19
Sex			
Male	.24	.26	.21
Female	.29	.29	.21
Poverty status during kindergarten year			
Non-poor	.20	.21	.15
Poor	.39	.44	.35
Race/ethnicity			
White, non-Hispanic	.24	.24	.17
Black, non-Hispanic	.48	.46	.38
Hispanic	.49	.56	.30
Asian	.73	.65	.56
Other	1.31	1.10	1.00
School type during kindergarten year			
Public	.23	.28	.20
Private	.45	.37	.33

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Table 4a.—Standard errors for children's mean mathematics t-scores, by school year, by child, family and school characteristics: 1998–99 and 2000

Characteristic	Fall kindergarten	Spring kindergarten	Spring first grade
Total	.21	.23	.22
Sex			
Male	.26	.26	.26
Female	.22	.25	.23
Poverty status during kindergarten year			
Non-poor	.19	.18	.19
Poor	.31	.40	.41
Race/ethnicity			
White, non-Hispanic	.22	.21	.20
Black, non-Hispanic	.35	.39	.49
Hispanic	.44	.49	.38
Asian	.67	.70	.74
Other	1.19	.85	.83
School type during kindergarten year			
Public	.23	.26	.25
Private	.39	.34	.30

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Table 5a.—Standard errors for percentage distribution of children by the resources they possess as they enter kindergarten: 1998

Resource	Has resource	Does not have resource
Proficient in recognizing letters at kindergarten entry	.86	.86
Read to at least three times a week at kindergarten entry	.72	.72
Proficient in recognizing numbers and shapes at kindergarten entry	.33	.33
Proficient in understanding relative size at kindergarten entry	.81	.81
Demonstrates positive approaches to learning often to very often at kindergarten entry	.71	.71
In very good or excellent general health at kindergarten entry	.48	.48

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Table 6a.—Standard errors for children's mean reading t-scores and t-score quartile distributions, by school year, by the resources children possess at kindergarten entry: 1998–99 and 2000

Resource	Spring Kindergarten					Spring First Grade				
	Mean t-score	Percent distribution of t-score quartiles				Mean t-score	Percent distribution of t-score quartiles			
		0–25 percent	26–50 percent	51–75 percent	76–100 percent		0–25 percent	26–50 percent	51–75 percent	76–100 percent
Proficient in recognizing letters at kindergarten entry										
Yes	.18	.64	.68	.72	.99	.15	.60	.78	.66	.92
No	.33	1.59	1.13	.94	.43	.28	1.42	1.28	.83	.58
Read to at least three times a week at kindergarten entry										
Yes	.24	.96	.59	.68	.95	.18	.76	.84	.67	.86
No	.37	1.79	1.27	1.28	.92	.33	1.58	1.17	1.08	.98
Proficient in recognizing numbers and shapes at kindergarten entry										
Yes	.23	.93	.54	.63	.88	.74	.70	.77	.62	.83
No	.59	2.58	2.39	.82	.53	.16	2.43	1.81	1.41	.73
Proficient in understanding relative size at kindergarten entry										
Yes	.17	.58	.64	.73	.93	.14	.53	.85	.73	1.03
No	.33	1.54	.97	.87	.56	.26	1.29	.99	.89	.51
Demonstrates positive approaches to learning often to very often at kindergarten entry										
Yes	.23	.90	.76	.71	1.09	.19	.72	.98	.72	1.07
No	.33	1.49	.83	.88	.73	.27	1.20	.83	.91	.75
In very good or excellent general health at kindergarten entry										
Yes	.25	.98	.57	.63	.92	.18	.76	.72	.62	.80
No	.41	1.87	1.37	1.45	1.21	.35	1.45	1.64	1.28	1.53

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Table 7a.—Standard errors for children's mean mathematics t-scores and t-score quartile distributions, by school year, by the resources children possess as they enter kindergarten: 1998–99 and 2000

Resource	Spring Kindergarten					Spring First Grade				
	Mean t-score	Percent distribution of t-score quartiles				Mean t-score	Percent distribution of t-score quartiles			
		0–25 percent	26–50 percent	51–75 percent	76–100 percent		0–25 percent	26–50 percent	51–75 percent	76–100 percent
Proficient in recognizing letters at kindergarten entry										
Yes	.18	.73	.59	.63	.86	.19	.77	.63	.59	1.02
No	.30	1.83	1.32	.85	.61	.33	1.50	.95	.91	.83
Read to at least three times a week at kindergarten entry										
Yes	.23	1.00	.61	.62	1.07	.21	.85	.56	.44	.84
No	.32	1.64	1.19	1.28	.80	.33	1.56	1.38	1.05	1.25
Proficient in recognizing numbers and shapes at kindergarten entry										
Yes	.20	.96	.55	.61	.75	.18	.80	.59	.44	.88
No	2.34	2.13	.67	.51	.51	.76	2.34	1.91	1.30	.41
Proficient in understanding relative size at kindergarten entry										
Yes	.14	.51	.68	.64	.83	.17	.57	.74	.66	1.11
No	.26	1.57	1.11	.77	.40	.28	1.36	1.00	.82	.47
Demonstrates positive approaches to learning often to very often at kindergarten entry										
Yes	.19	.73	.73	.68	.98	.19	.75	.72	.58	1.07
No	.30	1.61	.87	.92	.68	.28	1.25	.72	.67	.84
In very good or excellent general health at kindergarten entry										
Yes	.22	.97	.54	.61	.78	.21	.80	.56	.43	.87
No	.41	2.09	1.28	1.17	1.16	.38	1.84	1.27	1.31	1.24

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Table 8a.—Standard errors for percentage of children demonstrating specific reading knowledge and skills, by school year, the resources children possess as they enter kindergarten: 1998–99 and 2000

Resource	Spring Kindergarten				Spring First Grade			
	Beginning sounds	Ending sounds	Sight words	Words in context	Beginning sounds	Ending sounds	Sight words	Words in context
Proficient in recognizing letters at kindergarten entry								
Yes	.57	.79	.61	.26	.06	.13	.39	.92
No	1.41	1.01	.16	#	.41	.67	1.34	.84
Read to at least three times a week at kindergarten entry								
Yes	.86	.95	.56	.22	.13	.24	.58	.95
No	1.55	1.35	.60	.28	.42	.72	1.39	1.21
Proficient in recognizing numbers and shapes at kindergarten entry								
Yes	.84	.93	.51	.19	. .08	.18	.51	.92
No	2.12	1.18	.44	#	1.69	2.17	2.71	1.32
Proficient in understanding relative size at kindergarten entry								
Yes	.51	.70	.62	.28	.04	.09	.31	.90
No	1.36	1.06	.23	#	.34	.58	1.21	.91
Demonstrates positive approaches to learning often to very often at kindergarten entry								
Yes	.76	.92	.64	.30	.07	.18	.52	1.08
No	1.37	1.17	.41	.15	.31	.54	1.09	1.07
In very good or excellent general health at kindergarten entry								
Yes	.90	.97	.52	.21	.13	.24	.59	.94
No	1.58	1.43	.79	.46	.44	.71	1.34	1.48

Standard error based on an estimate of less than .5 percent.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Table 9a.—Standard errors for percentage of children demonstrating specific mathematics knowledge and skills, by school year, by the resources children possess as they enter kindergarten: 1998–99 and 2000

Characteristic	Spring Kindergarten			Spring First Grade		
	Ordinality, sequence	Add/ subtract	Multiply/ divide	Ordinality, sequence	Add/ subtract	Multiply/ divide
Proficient in recognizing letters at kindergarten entry						
Yes	.77	.59	.19	.15	.58	.84
No	1.10	.35	#	.71	1.16	.70
Read to at least three times a week at kindergarten entry						
Yes	.91	.58	.17	.28	.64	.74
No	1.30	.66	.21	.63	1.23	1.03
Proficient in recognizing numbers and shapes at kindergarten entry						
Yes	.84	.52	.15	.19	.59	.74
No	1.21	.36	#	2.59	2.15	.43
Proficient in understanding relative size at kindergarten entry						
Yes	.55	.57	.20	.08	.43	.88
No	.99	.23	#	.65	1.05	.46
Demonstrates positive approaches to learning often to very often at kindergarten entry						
Yes	.77	.66	.21	.17	.54	.89
No	1.22	.44	.09	.56	.99	.69
In very good or excellent general health at kindergarten entry						
Yes	.87	.55	.15	.27	.64	.75
No	1.65	.81	.31	.75	1.36	1.07

Standard error based on an estimate of less than .5 percent.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Base Year Public-Use and First Grade Restricted-Use data files.

Appendix

Table A.—Regression coefficients for the relationship between children's resources and skills to their spring kindergarten and spring first grade reading performance

	Spring kindergarten reading score		Spring first grade reading score	
	R^2	B	R^2	B
Literacy				
Model I				
Controls[1]	.09*	---	.09*	---
Letter recognition, fall kindergarten	.33*	10.22*	.27*	8.04*
Model II				
Controls[1]	.09*	---	.09*	---
Frequency read to, fall kindergarten	.10*	2.42*	.10*	2.31*
Model III				
Controls[1]	.09*	---	.09*	---
Numbers and shapes, fall kindergarten	.16*	11.85*	.18*	12.18*
Model IV				
Controls[1]	.09*	---	.09*	---
Relative size, fall kindergarten	.31*	9.35*	.27*	7.81*
Approaches to learning				
Model V				
Controls[1]	.09*	---	.09*	---
Approaches to learning, fall kindergarten	.17*	5.48*	.17*	4.88*
Health				
Model VI				
Controls[1]	.09*	---	.09*	---
Health, fall kindergarten	.10*	2.00*	.10*	1.88*

* significant at $p<.05$.

[1]The control variables are family's poverty status and children's race/ethnicity.

NOTE: Each model explores the relationship of a specific resource to children's spring kindergarten and spring first grade reading performance, while controlling for the influence of family poverty and children's race/ethnicity.

Table B.—Regression coefficients for the relationship between children's resources and skills to their spring kindergarten and spring first grade mathematics performance

	Spring kindergarten mathematics score		Spring first grade mathematics score	
	R^2	B	R^2	B
Literacy				
Model I				
Controls[1]	.13*	---	.12*	---
Letter recognition, fall kindergarten	.29*	8.43*	.29*	8.43*
Model II				
Controls[1]	.13*	---	.12*	---
Frequency read to, fall kindergarten	.13*	1.97*	.13*	1.97*
Model III				
Controls[1]	.13*	---	.12*	---
Numbers and shapes, fall kindergarten	.22*	13.38*	.22*	13.38*
Model IV				
Controls[1]	.13*	---	.12*	---
Relative size, fall kindergarten	.39*	10.13*	.39*	10.13*
Approaches to learning				
Model V				
Controls[1]	.13*	---	.12*	---
Approaches to learning, fall kindergarten	.22*	5.71*	.22*	5.71*
Health				
Model VI				
Controls[1]	.13*	---	.12*	---
Health, fall kindergarten	.13*	2.03*	.13*	2.03*

* significant at $p<.05$.

[1]The control variables are family's poverty status and children's race/ethnicity.

NOTE: Each model explores the relationship of a specific resource to children's spring kindergarten and spring first grade mathematics performance, while controlling for the influence of family poverty and children's race/ethnicity.

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